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TOWARD ENDURING PEACE IN SUDAN (TEPS)

SUDAN ENVIRONMENTAL THREATS & OPPORTUNITIES ASSESSMENT 2018

SEPTEMBER 2018

This publication was produced for review by the United States Agency for International Development.

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Contact Number:

AID-667-C-14-00001

Submitted to:

USAID Sudan

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ACKNOWLEDGMENTS

The Environmental Threats and Opportunities Assessment (ETOA) study was primarily conducted by Environmental Specialist Dr. Suad Badri under Toward Enduring Peace in Sudan (AID-667-C-14-00001), which is implemented by AECOM International Development. USAID/Sudan provided direction and support to conduct the desk study and surveys on several aspects of Sudan's biodiversity. The ETOA research team would like to express its deep appreciation to all stakeholders including ministers, universities, nongovernmental organizations, and research institutions in Sudan who shared their knowledge and expertise to inform this assessment. Our sincere gratitude also go to all those who facilitated information gathering in the different locations we visited during the survey, and those who arranged our interviews with key biodiversity experts in Sudan.

EXECUTIVE SUMMARY

This report, Sudan Environmental Threats and Opportunities Assessment (ETOA), provides an overview of key trends in Sudan's environment and natural resources sector and highlights the primary threats and opportunities that exist today with special focus on forests and biodiversity conservation. Per the Foreign Assistance Act (FAA) Sections 118 and119, this study provides an assessment to identify actions necessary to achieve conservation and sustainable management as well as conserve biological diversity. This study also provides an analysis of the extent to which USAID/Sudan meets the actions necessary to conserve biodiversity and tropical forestry in Sudan.

USAID/Sudan conducted an ETOA with special focus on Tropical Forests and Biodiversity in Sudan inn 2003, which was further updated in 2012. Since the 2012 update, the political, environmental, and social environment in Sudan has changed significantly. USAID/Sudan is in the process of developing a new Country Development Cooperation Strategy (CDCS) within this recent country context, and therefore requested for an updated ETOA to be undertaken by the author and assessment team.

ECOLOGICAL SYSTEMS AND LAND USE TRENDS

TERRESTRIAL BIODIVERSITY AND WILDLIFE

In most of Sudan's arid and semi-arid lands, wildlife numbers are declining due to rangeland degradation and poaching. Migration corridors are being fenced and farmed in many districts. Rapid growth of human populations in some key wildlife areas has serious detrimental effects on wildlife. However, protected areas and protection efforts that draw together local communities are making it possible for wildlife – at least some species – to increase in some areas, while in other areas parks are being encroached on for livestock grazing, forest cutting, and agricultural use. The capacity of the responsible agencies to continue protecting these areas – particularly the extensive, non-protected range areas of the wildlife they house – is in question, for many observers. These trends in the wildlife sector are likely to have serious impacts; if they go unchecked, vital species and globally important wild animals could be lost forever from Sudan and perhaps the whole of East Africa. Other forms of biodiversity, including plants, wetland inhabitants, and marine species, must also be protected.

FRESHWATER, MARINE, AND COASTAL RESOURCES

Freshwater and coastal ecosystems provide a multitude of rich resources for Sudan's livelihoods and the national economy. Sudan's Red Sea coast is endowed with richly diverse coral systems that house and support critical fisheries and mangroves—all factors that encourage coastal stability. A number of these aquatic systems are also internationally recognized for their unique ecological attributes and role in supporting regional bird, wildlife, and marine species migrations. Despite this, they remain fragile and unprotected systems.

In many urban areas, city services are poorly maintained. In the absence of waste removal systems, untreated pollutants, both municipal and industrial wastes, go directly into street gutters, urban waterways, and eventually natural freshwater and coastal ecosystems. Unsustainable water extraction, pollution from agrochemicals and industrial waste, and coastal outflow areas are increasing. In coastal areas, increasing pollution from inland sediments, oil shipping, industrial dumping, and expanding human waste streams is a serious concern. Over-extraction of coastal and marine resources and inadequate economical control add to the pressure on reefs. The population is growing most rapidly in water-rich areas, and competition for water is rising in wildlife and agricultural areas. Institutional responsibilities to ensure water is protected are not adequately invested in conservation agencies, and more importantly, lack the mandate to draw other sectors, such as agriculture, forestry, industry, etc., into the

discussion. Health impacts of degraded water quality are not well understood and integrated water resources management is largely absent. A new wetlands policy must be adopted to provide hope for the distant future.

FOREST RESOURCES

Forest conversion of gazetted and protected forests for political reasons into agricultural areas, fuelwood collection for domestic use and markets, excessive collection of timber and non-timber products, and plantation mismanagement are rapidly depleting natural capital in Sudan. Wood fuel provides an estimated 98% of all domestic fuel/energy resources in Sudan today. Forests provide Sudan's only watershed protection mechanism and when they are gone, downstream water quality will decrease, and sedimentation and flooding will increase. In addition to decreased density and acreage of native hardwood and indigenous fruit trees, the extent of coastal mangroves has rapidly decreased.

The challenges to protect forests have been exacerbated by unplanned, non-sustainable and poorly managed use of land and water, climate variability, and reoccurring droughts that has led to a steady decrease of rainfall since the 1970s. Forest ecosystems throughout Sudan have been deforested and degraded due to fire, uncontrolled grazing, overcutting, and encroachment by agriculture.

The opportunity to address increasing forest resources in Sudan will have an enormous impact on other regions and systems throughout the country, including soil fertility, the health of streams and rivers, the productivity of coastal fisheries, habitats for plant and animal biodiversity, etc. A new forest policy is critical to address some of the forces behind these negative trends.

AGRICULTURAL AND ARABLE LAND RESOURCES

Agriculture employs more than 70% of Sudan's workforce. However, this only provides an average of 1/5 ha per rural inhabitant because arable land is vulnerable to "grabbing" in Sudan's political climate. Currently, subdivision of commonly held lands and conversion of forests, wetlands, and drylands to permanent agricultural use is driving environmental degradation into many areas. Traditional livelihoods, such as livestock management, are also constrained by the need for grazing areas, water scarcity and competition for water resources, and low market values. Official land use and tenure policies are ambiguous and do not support planning approaches that would help alleviate some of these problems.

Increasing pressure on land by the expansion of mechanized and rain-fed farming, as well as overgrazing, have restricted access to rangelands and increased vulnerability of farmers and pastoralists. In addition, the greatest damage to wildlife has been inflicted by habitat destruction and fragmentation from farming and deforestation. The degradation of the country's natural resources has caused serious negative impacts on agricultural productivity and the livelihoods of the poor, particularly those that depend on livestock and rain-fed agriculture. Additional challenges resulting from increasing vulnerability to climate change elevates the need for ensuring that sectoral planning and interventions in these sectors cater to strengthening adaptive capacity and resilience of both the sectors and the dependent rural communities to climate induced natural disasters.

ACTIONS NECESSARY, MISSION RESPONSE, AND RECOMMENDATIONS

ACTIONS NECESSARY TO ACHIEVE CONSERVATION

The assessment of actions necessary begins with a review of recent sources that present the views of the Government of Sudan on this topic. These are: 1) the Fifth National Report submitted to the Convention on Biological Diversity in 2009 and 2) the Stocktaking and National Biodiversity Targets

Setting Report. From these reports, the assessment team compiled a list of actions necessary that include social, scientific, and educational responses to identified threats. Illustrative examples of such responses include:

1) Scientific research to understand climate change effects on marine and terrestrial biodiversity to design resilience into the Protected Areas (PA)/Marine PA systems;
2) Support for high-quality environmental journalism to raise public awareness of coastal forests;
3) Education campaigns on the value of forests;
4) Support of legislation to protect wildlife, forests, and land;
5) Support for forest sector institutions, especially Community Forestry Associations;
6) Capacity-building on non-governmental organizations (NGOs) to better educate and advocate for biodiversity and forest conservation;
7) Development of incentives to conserve wildlife outside of PAs on community and private lands;
8) Diversification of the geographic base of wildlife tourism in Sudan

The list is instructive because it demonstrates that there are some very specific actions needed that are associated with particular ecosystems, and others that apply to more than one ecosystem. Given Sudan's ecological, economic, and cultural diversity, there can be no such thing as "one size fits all" conservation policy.

In identifying some of the key "actions necessary" for conservation, our analysis also followed the logical framework of this assessment – actions needed are those that remove or reduce the social, political, and economic causes of the threats to biodiversity.

USAID/SUDAN'S RESPONSE TO IDENTIFIED THREATS AND DRIVERS

USAID/Sudan is presently working towards meeting the identified needs through its portfolio of environment and natural resource management (NRM) activities. USAID/Sudan's strategic plan supports programs in health, democracy and governance, agriculture, and NRM. Most important in this regard are the programs in agriculture and biodiversity conservation. Through careful activity design, synergies will ensure environmental sustainability for future agriculture and biodiversity conservation programs.

The Mission's agriculture support program is usually worked out to detail its underlying approach to environmental – and closely related social – sustainability issues. The biodiversity program takes a tested, community-based approach that encompasses some forest conservation as well. Lack of staffing and financial resources; however, restrain all Mission programs, limiting its ability to respond comprehensively to environmental protection.

USAID/Sudan recently proposed to implement a pilot project in Northern Darfur under TEPS. The project proposes a variety of adaptation options and interventions that are designed to reduce conflicts, increase community resilience, and enhance capacity of local natural resource management. The project will also foster creative conducive conditions necessary for peace, help normalize communal relations, and reduce major sources of conflict.

KEY RECOMMENDATIONS

The combination of environmental and socio-economic threats in Sudan hinder peaceful coexistence and encourages a continuous cycle of recurring humanitarian crises. To break this cycle, there must be an

investment in sustainable development that is founded on the conservation of biodiversity and its many societal benefits. USAID recognizes that improving livelihoods, security, and human and economic development depends on the conservation of biodiversity in healthy ecosystems.

Analysis of the threats, causes, and actions necessary to converse Sudan's biodiversity and forests led the assessment team to identify four major ecosystems as high priorities for actions:

- Savanna, grassland, woodland, and bushland in arid and semi-arid areas
- Coastal and marine zones including beaches, mangroves, and coral reefs
- Coastal forests
- Montane forests and any forested hill ranges

The proposed priority ecosystems and themes can be used as a conceptual framework for designing strategies and programs to conserve biodiversity and tropical forests in Sudan.

The dynamic ecological mosaic of savanna grassland, woodland, and bushland in the arid and semi-arid lands of Sudan stand out as high priority for several reasons: 1) they cover approximately 80% of the country and are threatened with degradation from unsustainable grazing caused by large-scale movements of wildlife and livestock; 2) they support traditional pastoral communities who live in areas unsuitable for significant crop production; and 3) the forest ecosystem accounts for the greatest percentage of area loss in comparison to other ecosystems; 4) the demand for fertile land and resultant conflicts threatens their existence.

CONCLUSION

All sectors are estimated here to have potentially negative impacts to the health of ecosystems as well as with negative economic and social consequences. For health – land, water, urban, and to some extent forests are likely to have the most severe consequences and/or to pose the gravest threat to the Sudanese people. For ecosystems – land, forests, and aquatic systems face potentially "catastrophic" threats if swift remedial action is not implemented. Wildlife and biodiversity face critical consequences if sustainable changes are not enacted. For economic and social issues – wildlife, land, and forests pose the most severe problems for Sudan and the Sudanese people.

Despite this grim scenario, there is cause for optimism. The non-for-profit sector is increasingly contributing to better the environment than in past years, and it regularly monitors environmental crises. Popular demand for better governance of natural resources is growing. At local levels, interest is increasing for participating in and benefiting from the wise use of resources. Thanks to the community conservation program, local constituencies for wildlife have grown. There are signs that wildlife is slowly recovering. Key institutions are working to get internal management systems in order, and knowledgeable people in the environmental community in Sudan have high hopes of the policies mentioned above.

I. INTRODUCTION

1.1 PURPOSE

This study on threats and opportunities assessment is a formal requirement of the USAID strategic planning process per FAA 118/119 and is designed to support the priority-setting process of the USAID/Sudan Mission in developing its next five-year plan. The guidance notes that an assessment should consider the "full range" of threats and rank them using the Agency's three environmental objectives for "sustainable development."

- Safeguarding the environmental underpinnings of broad-based economic growth
- Protecting the integrity of critical ecosystems
- Ameliorating and preventing environmental threats to public health

In addition, the guidance helps interpret USAID internal regulations on environmental sustainability and tropical forests and biodiversity. These regulations are in place to help Missions make the best use of current scientific and social research on environment in their decision-making processes. A draft version of an assessment of the Sudan Mission's compliance with these regulations can be found in Annex 1.

During 2012, the Sudan USAID Mission supported a thorough process to ensure that its move into a new environmental program addressed the issues as defined by a range of experts working with its many partners in country and in Washington, namely Sudan ETOA 2012. This current document supports that process by providing a broader update of the threats facing the environment in Sudan, based on available data and interviews with expert informants within Sudan's leading Environmental agencies. This process also helps in judging the relative severity of the threats facing each sector. Where suggested by informants, specific opportunities come as complementary section.

As noted in the study guidance, the "relative severity of problems need not necessarily dictate environmental priorities and assistance strategies." Similarly, the opportunities section of this assessment is provided for a broad range of parties who might be interested in addressing "environmental threats in Sudan." Nevertheless, the threats analysis along with the opportunities and linkages between sectors provides a framework in which to consider activity-level and synergistic programming options during the coming period of the USAID integrated strategic plan.

1.2 BRIEF DESCRIPTION OF THE USAID PROGRAM

USAID/Sudan's strategic plan supports programs in health, democracy and governance, agriculture, and natural resources management. Through careful activity design, synergies between them will ensure environmental sustainability of the Mission's program as it is implemented over the next few years. Most important in this regard are the programs in agriculture and biodiversity conservation. The Mission's agriculture support program is usually worked out to detail its underlying approach to environmental – and closely related social – sustainability issues. The biodiversity program takes a tested, community-based approach that encompasses some forest conservation as well. Lack of staffing and financial resources; however, restrain all Mission programs, limiting its ability to respond comprehensively to environmental protection.

Currently, USAID/Sudan is implementing the Toward Enduring Peace in Sudan (TEPS) project, focusing on three development objectives to improve:

1. Intra and inter-state relations at the community level;
2. Civil society participation in transition processes; and
3. The resilience of communities to withstand social and economic shocks.

Through this project, USAID has worked on a variety of adaptation options and interventions that are designed to reduce conflicts, increase community resilience and enhance local natural resources management capacity. These activities also aim to create conducive conditions for peace and help normalizing inter-society relations and removal of major causes of conflict.

1.3 METHODOLOGY

The ETOA addresses the status and severity of environmental problems in relevant sectors in Sudan with respect to USAID environmental objectives and in accordance with USAID guidance for strategic plans. This assessment is undertaken through a desk review and field consultations, to acquire additional data and views; followed by a wrap-up period. Throughout the exercise, relevant documentation was reviewed, and key informants were interviewed (Annex 3).

Although it is difficult to draw lines between environment sectors such as between biodiversity and forests or between agricultural resource use and rural water availability, the study has endeavored to do so to allow readers to focus on specific interest areas. To overcome the artificiality of the separations, specific interest areas are cross-referenced. The study draws on general statistics and trends followed by a discussion of some key areas where informants and recent studies indicate that environmental threats are significant. The study also presents an overview of the relative severity of threats in the sectors, according to expert opinion. Agricultural resources are defined here to include livestock, water, soil, and land.

To select specific sites and appropriate and interventions, a field survey was carried out by the study team during the period 15-25 March 2017. Intensive bottom-up consultative processes at the state, locality and community levels were conducted. Meetings and focus group discussion were conducted with government institutions and departments, NGOs, native administration leaders and the target communities. Based on this consultative process, two sites were selected in North Darfur State.

Throughout the last decade well noted efforts took place, in Sudan, to document reports of the work conducted by several specialized working group, established with the main objective to generate the necessary updated information on the current status of the Sudan critical biodiversity and ecosystem in the view of recent secession of the country, and to support the updating of the entire biodiversity and planning process in Sudan, as well as to identify gaps and constraints facing biodiversity in Sudan.

II. COUNTRY CONTEXT

2.1 LOCATION AND COUNTRY CONTEXT

Sudan lays in Northeast Africa between latitudes10°and 22° N and longitude 22° to 38° E. The country faces environmental challenges due to its geographic location within the fragile Sudano-Sahelian and sub-Saharan African zones; short and variable rainy seasons, arid lands, and sparse vegetative cover contribute to the country's vulnerability. Like in other Sahelian countries, livelihoods in Sudan depend heavily on soil, water, and vegetation resources. Current estimates place agriculture (crops, livestock, and forestry) at 35-40% of GDP (with livestock accounting for 50% of production) and employs more than 80% of the total population. Traditional farming accounts for 60-70% of the agricultural output and is largely subsistence production based on shifting cultivation and livestock rearing. Agriculture and livestock are thus essential to the country's growth and economic diversification and overall macroeconomic stability, especially with the dwindling revenues from oil and loss of one third of its following the 2011 secession of South Sudan. Investments in these two key sectors also provide space for creating jobs and improving livelihoods especially in rural areas, attracting potential private sector investments in soil, land and water management, and human development.

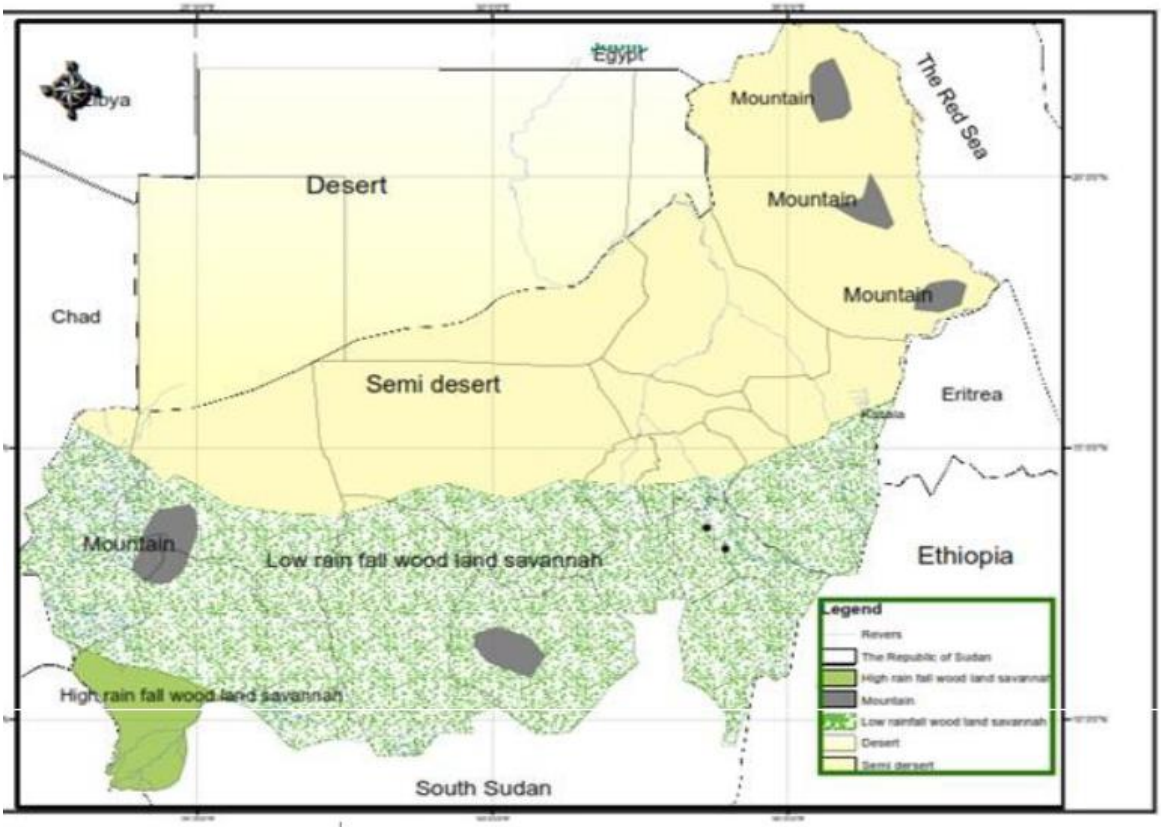

FIGURE 1 - SUDAN PHYSICAL GEOGRAPHY

There has been a steady increase of both human and livestock populations that puts pressure on natural resources, and may result in desertification, land degradation, water pollution, soil erosion and nutrient loss, and deterioration of biodiversity across large tracts of the country. Occasional floods, such as the flood in August 2013 that impacted more than 300,000 people, further exacerbate the precarious environment. In addition to fundamental repercussions resulting from the 2011 secession as detailed

above, a lack of ecologically sensitive and sustainable development policy in Sudan has fueled conflict, famine, and environmental degradation for decades. Natural disasters, coupled with the crippling effects of climate change, have led to the loss of biodiversity and forests and have intensified resource-based conflicts and competition, particularly localized conflicts where violence easily erupts in the absence of strong governance institutions.

2.2 BIOPHYSICAL SETTING

Sudan is rich in biodiversity with diverse ecosystems that consists of different species of fauna and flora, which are presently subjected to a number of threats resulting from natural factors and human activities. The diversity of Sudan's climate is responsible for the rich flora and fauna. The most salient geographical features of the country are the Nile Valley, and Nubian and Bayuda Deserts in the north. The River Nile and its tributaries that traverse the country have varying degrees of influence on irrigated agriculture and livestock production systems. There are also many seasonal rivers and water courses; large ones, such as the Gash and Baraka, originate within the Ethiopian highlands to form two inland deltas in Sudan, and are important for flood irrigation agriculture. Also, there is a vast resource of groundwater, estimated at about 9,000 billion m^3, which has a varied distribution, quantity, and quality in different parts of the country, with the Nubian Sandstone aquifer the most important.

Rich forests grow along the Nile and its tributaries. Most of the wildlife resources of the country are found within the high rain savanna woodland. The vegetation follows the ecological classification profile and rainfall trends as from north to south with vegetation taking the form of bush land and scattered trees and shrubs in the north and in dense forests of large trees in mixture of acacias and broad-leaved trees in the southern end of the savanna and mountain region. Rich forests grow along the Nile and its tributaries. Most of the wildlife resources of the country are found within the high rain savanna woodland.

III. STATUS OF THE COUNTRY'S BIODIVERSITY (AND TROPICAL FORESTS)

3.1 MAJOR ECOSYSTEM TYPES AND STATUS

Presently there is no easy way of knowing the status of wildlife and biodiversity conservation in Sudan although it is very clear that hunting pressures are out of control and unsustainable. Support for strategic analysis and capacity building in the wildlife sector and a continuation and expansion of these efforts will be the best short-term investment to ensure better stewardship of the country's once globally significant wildlife populations in Sudan.

3.1.1 TERRESTRIAL ECOSYSTEMS

Sudan is a vast country with an area of 1.8 million squared kilometers. It lies between latitudes 10° and 22° N and longitude 22° to 38° E. Its landscape consists primarily of gently sloping plain, except for Jebel Marra Masssif, Red Sea Hills, and Nuba Mountains. The mean annual temperatures vary between 26°C and 32°C across the country. The northern part is almost desert and semi desert with average annual temperatures around 30°C and average annual rainfall about 150 mm/year. The central area is semi-desert to savannah with average annual temperatures around 27° C, and rainfall averaging to about 200 mm/year. Rainfall, which supports the great majority of agricultural activity, is erratic and varies significantly from the northern to southern areas of the country. Sudan can be ecologically divided into five vegetation zones according to rainfall patterns from North to South. These are:

i. Desert: (0-75 millimeters of precipitation)
ii. Semi-desert: (75-300 mm)
iii. Low rainfall savannah on clay and sand: (300-900 mm)
iv. Low rainfall savannah
v. Montane Vegetation: (500-2000 mm)

Sudan is endowed with a wide range of ecosystems and species diversity. The ecological zones extend over a wide range from the desert in the extreme north to the savannah. According to a recent FAO (2012), Land Cover Atlas of Sudan, Forests together with Rangeland represent 35.6% of the total country. Percentages of primary ecosystem types are:

- Coastal Aquatic: 1%
- Major Wetland: 2%
- Desert and Semi-desert: 24%
- Grass and Shrub: 52%
- Crop and Settlements: 10%
- Interrupted Woods: 8%
- Major Forests: 2%

There is an active debate occurring throughout East and Southern Africa, about the issue of wildlife habitat, animal migration, protected areas, and conflict with livestock and agricultural interests. There are efforts to protect not only wildlife in national parks, but also in surrounding areas, common lands, and privately held lands and reserves. Increased conflict is a consequence of decreased habitat needs for human needs in farming and grazing for domestic animal depriving wildlife from such natural resources. Migration from densely populated areas or areas of conflicts led to changes in land tenure legislations and hence to rapid subdivision and fragmentation of the land. The result has been that large areas of natural vegetative habitats for wildlife are now gone from that area.

The consequences for wildlife are clear, when habitat is degraded both wildlife and domestic animals either move to new areas or owners gradually reduce their numbers or die out. Farmers face the loss of direct economic benefits as well as indirect such as the lack of wild fruits and also prevents the establishment or maintenance of bee colonies for honey collection.

3.1.2 AQUATIC ECOSYSTEMS

The Nile River System is the main lotic system in Sudan. Its main axis runs for about 1,700 km within the borders of Sudan. The system is made of the Blue Nile, White Nile, and the seasonal rivers such as Atbra, Dinder, and Rahad. The Nile System in the Sudan is a mosaic of contrasting combinations: long and short; fast and slow; permanent and seasonal; Azrag and Abyed; silty and clear; infested and weed-free and dammed and free flowing. Other non-Nilotic lotic waters also exist and are represented by seasonal water courses (Wadis/Khors) such as Khor Baraka, K. El Gash, K. Abu Habil, Wadi El Mugaddam, W. Kaja, W. Nyla and others.

Sudan is endowed with several wetland areas that play a vital hydrological and ecological role. Water conservation activities trap and slow seasonal flow of rain water in water harvesting structures or in case of Nile large dams store water for irrigation of agricultural schemes. The delay and extension of flood peaks can facilitate downstream fishing and irrigation, especially in areas with an extended dry season. Wetlands provide habitat for numerous species of animals and plants, many of them unique to these ecosystems. Those wetlands which are near the edge of the Sahara (Khartoum Sunut Forest) provide vital staging grounds for migratory birds preparing to cross southwards. Wetlands also trap and hold silt carried by rivers, creating fertile alluvial soils that may be used to grow many crops and vegetables. However, agricultural development schemes taking advantage of availability of water and fertile soils pose threat to wetlands which cover about 20% of the total area of the country.

The biodiversity in inland waters in Sudan is characterized by the following:

- Limited locations and distribution
- With the severance of Southern Sudan, the area of inland waters has shrunk significantly. Vast and ecologically valuable areas such as the "Sudd" are no longer within Sudanese borders. Almost all inland waters are confined to the narrow strip of the Nile River system in Sudan, except a few lakes in western Sudan.

3.1.3 COASTAL AND MARINE ECOSYSTEMS

The Sudanese coastline of the Red Sea is about 750 km long, including bays and inlets. Typical features of the coast are mainly costal lagoons and sheltered bays (marsas) that form natural harbors and fish landing places. Several of these lagoons are fringed by mangroves. Sea grass beds are frequently found in the shallow waters of marsas, and in the lagoons, between the coast and the reefs. These features contain a spectacular biological diversity of ecosystems and species that require considerable efforts for conservation.

3.1.4 MANGROVES

Avicennia marina was the only mangrove species found in the Sudanese coast during a recent survey (PERSGA, 2004). Mangroves are distributed along the Sudanese coast from Mohammed Qol north of Port Sudan to Shabarango-Gafud south of Suakin. Mangrove lagoons and channels are occupied by numerous fish species including many commercially important species. The leaves and shade zones provide additional habitat. In addition to marine organisms, mangroves are used as a food source by terrestrial vertebrates and as a roosting and nesting site by many species of birds.

3.1.5 MARINE ECOSYSTEMS

Sudan is a member of the Regional Organization for the Conservation of the Marine Environment of the Red Sea and the Gulf of Aden (PERSIGA), which is a regional effort supported by the Global Environmental Facility (GEF) to conserve the marine and coastal environment of the Red Sea and to promote compatibility and a balance of use. Accordingly, synchronization of efforts and rational utilization of resources are extremely needed to achieve significant progress in this area.

A regionally applicable manual of standard survey methods for key habitats and key species in the Red Sea and Gulf of Aden was produced by PERSGA (English & Arabic). Regional action plans, following regional surveys, were developed for corals, mangroves, turtles and breeding seabirds and are waiting for implemented nationally via national action plans.

Site-specific master plans, with management guidelines, have been written for Dungonab Bay and Mukawwar Island MPAs with the involvement and participation of local stakeholders.

Substantial progress has been made in the field of integrated coastal zone management (ICZM) in Sudan including completion of coastal profiles and preparation of an ICZM plan (awaiting official approval). With regard to sea-based and land-based sources of pollution two national plans have been prepared: The National Oil Spill Contingency Plan approved by the Government) and the National Program of Action for the Protection of the Marine Environment from Land-Based Activities.

3.2 STATUS OF TROPICAL FORESTS

There are about 533 trees species in the Sudan 25 of which are exotics. Also there are about 184 shrub species in the Sudan of which 33 are exotics. Some of the species have a wide range of distribution and considerable variation within the species. However, the vegetation of Sudan forests is not adequately explored or adequately documented. Some forest formations are unique in Sudan such as the Mangrove Forests along the Red Sea Coast and other unique forests on mountains and hills.

Those considered seriously threatened are 241 tree or shrub species, which showed marked retreat in their distribution and/or regeneration due to climatic conditions and also due to the intensity of their removal for wood, fodder or clearance for cultivation. Also endangered are 43 exotic shrubs or tree species.

A wide range of forests and related vegetation types is found in Sudan due to regional variations in soil and rainfall. The most important types are listed below, in rough order of distribution from the arid north to the tropical south: Desert and semi-desert trees and shrubs; riverine forests; low rainfall woodland savanna; high rainfall woodland savanna; montane and gallery forests; tropical forests; and plantations.

3.2.1 DESERT AND SEMI-DESERT TREES AND SHRUBS

Desert vegetation in the northern states (Northern, Northern Darfur, Northern Kordofan, Kassala, and Red Sea) is limited to xerophytic (droughtresistant) shrubs, such as *Acacia ehrenbergiana*, *Capparis decidua*, *Fagonia cretica*, and *Leptodemia pirotechnica*. Scrub formations occur in the semi-desert zone (the northern half of Kordofan and Blue Nile states, all of Khartoum state, most of Red Sea state, and some parts of Darfur), where the vegetation is a varying mixture of grasses and herbs with widely scattered shrubs.

3.2.2 RIVERINE FORESTS

Riverine forests are a critical resource for the northern states. They occupy the lands that are flooded when rivers rise in the latter part of the wet season. *Acacia nilotica* – the dominant species – is found as pure dense stands over large areas from the Egyptian border in the north to as far south as Jebelein on the White Nile, and Roseires on the Blue Nile. The species also occurs along the Dinder and Rahad rivers. In less frequently flooded basins along the Atbara River and in some inland sites, *Acacia nilotica* is replaced by *Hyphaene thebaica* (Dom palm) forests.

3.2.3 LOW RAINFALL (< 900 - 1,000 MM) WOODLAND SAVANNAH

The low rainfall woodland savannah region lies in the center and south of the country, with the exclusion of the flood region. Rainfall is confined to a few months of the year (March or April to July). The vegetation is composed of mixed grass types with bushes and trees, but species distribution within the low rainfall savannah zone varies with rainfall and soil type.

Sandy soils dominate in the west and central regions, and clay soils are prevalent in the east and south. In the drier parts, trees are nearly all thorny and low in stature, with a predominance of species of acacia. Broadleaved deciduous trees become prevalent in the wetter parts, but there is not as great a variety of species as in the high rainfall woodland savannah, and thorn trees are usually present. The gum Arabic belt lies within this zone. The belt occupies an area of 520,000 km² between the latitudes of 10° and 14° N, accounting for one-fifth of the total area of the country.

3.2.4 MONTANE AND GALLERY FORESTS

Mountains in Sudan are characterized by higher rainfall, resulting in different and more robust woodlands than in the surrounding areas. The Jebel Marra plateau in Darfur is the most important ecosystem of this type in the drier parts of Sudan, as well as in the Red Sea hills in the north-east. Important species include *Podocarpus milanjianus*, *Juniperus procera*, and *Pinus radiata*. Planted exotics include *Eucalyptus microtheca* and *Cupressus spp*.

3.2.5 TREES FOR FUELWOOD AND CHARCOAL MAKING

The most important use of wood in Sudan is for fuel. Forests annually provide 16 million m³ of firewood, industrial and sawn timber. The contribution of forestry to national energy supply is estimated to account for 70% of the total energy consumed in the country (FNC, 1994). About 82% of the firewood consumed in household was freely collected in rural area. In addition natural forests provide 30% of the feed of the national herds (Ibrahim, 2000). The forests and woodlands also provide a wide range of useful non-wood products such as honey, beeswax, medicinal plants, fruits, etc., contributing directly to the subsistence needs of local communities.

3.3 SPECIES DIVERSITY AND STATUS

As a country with a high level of ecosystem diversity, the total number of species found in Sudan notably exceeds that of most countries. The absolute number of species, or species "richness," reflects the evolutionary history of a place and is correlated with the productivity of the ecosystem. The total number of species in Sudan is 267 and number of endemic species is 11. The number of threatened species was 21 (8% of total species) in 1996 and 26 (10%) in 2000 (IUCN). Sudan is characterized by a wide variation in ecosystems and this has been reflected in wildlife, where diversity and diversity of species and animal species. The wild species in the country are distributed according to the type of climate and the environment: savanna, desert, mountain, wetlands. For a full list of threatened species, see Annex 7.

3.4 GENETIC DIVERSITY

As a country with a high level of ecosystem diversity, the total number of species found in Sudan notably exceeds that of most countries. The absolute number of species, or species "richness," reflects the evolutionary history of a place and is correlated with the productivity of the ecosystem.

Genetic diversity within a single species is always present, and it allows species to tolerate a range of environments and adapt to environmental changes over evolutionary time. Such intra-specific genetic diversity is often reflected in partial genetic differentiation of populations throughout the range of a species. Subspecies of a single species are one example of this.

Subspecies of more widely dispersed species are common in Sudan. Population genetic studies are often needed to reveal such underlying genetic diversity, such as in Sudan's monkey populations. To conserve biodiversity, especially in the face of possible environmental changes such as those likely to occur due to global warming, it is important to conserve the full array of genetic diversity within a species. This will provide the species with the genetic diversity necessary to survive, adapt, and evolve.

The Patas Monkey (*Erythrocebus patas*) is an example of a species that is on the edge of its range in Sudan, and Sudan populations of this species undoubtedly have a genetic makeup different from that of the core population. Blue Nile Patas Monkey occurs in a broad band across Africa between the Sahara and the equatorial rain forests. The geographic range of this species in Sudan has declined evidently, and the gaps among populations have increased, so this unique genetic variation is being slowly lost.

3.5 STATUS AND MANAGEMENT OF KEY NATURAL RESOURCES OF PROTECTED AND UNPROTECTED AREAS

Since its inception and in cooperation with the relevant authorities, the Department has sought to establish nature reserves representing all environmental systems in Sudan. The movement of protected areas started in 1935 after the London Conference on the establishment of nature reserves in Africa. There are now 8 federal reserves and 4 reserved areas birds.

A primary pressure on wildlife derives from the economic needs of rural communities, who are asked to forego agricultural, ranching, and other uses of land needed for parks or other protection mechanisms. Community-based wildlife management is an approach developed to address this issue, yet it has not entirely fulfilled its promise in Sudan.

The forest administration is now involving local communities in arrangements of joint forest management, on a pilot bases, to improve forest management and to deal with other problems. Hence an entirely new concept, termed collaborative forest management, has quickly emerged. This concept has proved to be useful as a tool for sustainable development.

The balanced approach to biodiversity conservation can be achieved through the ecosystem approach and through efforts to involve all sectors of society in the conservation and management of biological diversity. The Biosphere Reserve concept is one way of involving people in biodiversity conservation. This approach links ecology with economics, sociology and politics. Performance and achievement are evaluated on a regular basis and the views and desires of local communities remain paramount.

See Annex 4, which details the National Biodiversity Resource Mobilization Plan 2015-2020 matrix for the status and management of key natural resources both inside and outside protected areas.

IV. VALUES AND ECONOMICS OF BIODIVERSITY

4.1 VALUE OF BIODIVERSITY

Biological diversity provides social and economic benefits of three distinct kinds: ecosystem products, ecosystem services, and non-material benefits (USAID, 2005a; Byers, 2008). Sudan enjoys diversified biological resources making the country one of the richest in biodiversity. The diversity of the Sudan's climatic conditions is responsible for its rich flora and fauna. Agricultural activity, including animal production and forest related activities in Sudan, is based on the indigenous heritage of plant and animal species that form an important component of the country's wealth of biodiversity. The forestry sector contributes some 12% of the Sudanese GDP, besides the indirect benefits it renders in the way of environmental protection, biodiversity conservation, soil amelioration, work opportunities for rural population and others. Perhaps the most tangible benefit derived by the people of the Sudan from their forests is fuel in the form of firewood and charcoal as well as gum Arabic of which its annual export ranges between 20-40 thousand tons. Rangelands contribute substantially to income and subsistence of a large sector of the population who are either pastoralists (nomads) or agro-pastoralists by providing important forage feed resource. It supplies about 70% of the total feed requirement of national herds, which estimated as 104.9 million heads (Ministry of Livestock, Fisheries and Rangelands (MoLFR), 2012).

Sudan possesses an immense and diversified wealth of animal resources, ranging from the domesticated livestock species to the wild and aquatic life which contributes significantly to the food security as well as forming a considerable base for the economy of the country. Livestock goes beyond its influence on the economy to its role in securing national and strategic food. It allows self-satisfaction in meat (100%). Export of animals reached 3,770,240 heads out of which is 3,415,739 heads of sheep that amounted to about 451 million Dollars' worth in 2012 (MoLFR, 2012). Also, the contribution of the sector in the national income is estimated to be 18–25 % and it represents a livelihood activity for about 60% of the population as well as providing labor for about 40% of the population (MoLFR 2012).

Sudan is part of the FAO Commission on Genetic Resources for Food and Agriculture, which is the only intergovernmental forum that deals with whole range of genetic resources for food and agriculture. The importance of the genetic resources for food and agriculture stems from the fact that it is building block of biodiversity. It is realized that biodiversity provides the basis for livelihood and sustainable social and economic development; and food security.

The Sudanese economy is predominantly agricultural (including crop and livestock production, forestry, wildlife and fisheries) with an overall average contribution of about 45% to the country's GDP. The agriculture sector provides employment for some three-quarters of the population and accounts for about 60% of the raw materials needed by the manufacturing sector. Agriculture provides more than 90% of the non-oil export earnings. Cotton is the main export commodity, followed by oilseeds and livestock. The Sudan is the world's largest producer of gum arabic, whose exports range between 20,000 and 40,000 tons and earn some 50–80 million USD. The map above shows share of agricultural sectors in land cover and productivity of agricultural lands.

According to the Central Bureau of Statistics, during the period 2009-2013, the Agriculture sector contributed on average about 34% of the country Gross Domestic Product (GDP); ranging between 32.2% in 2009 and 34.4% in 2013. The secession of South Sudan led to contractions in the economy and the agricultural sector. In 2009 the largest share of agricultural GDP was derived from livestock production (47%), followed by large-scale irrigation (28%), traditional rain-fed farming (15%), forest products (7%) and semi-mechanized farming (3%). Agriculture provides a livelihood to approximately two-thirds of the population as of 2013 and employs about 60 per cent of the labor force. According to

the latest population census, Sudan has 37 million populations. As much as 41% of the population is under 15 years of age while 20% is between 15 -24 years.

4.2 ECOSYSTEM GOODS AND SERVICES

Ecosystem products are direct material benefits derived from species harvested for such things as food, fiber, building materials, medicines, fuel, and ornamental plants and pets. These include: timber, fuelwood, charcoal, mangrove wood, gums and resins, fisheries, and other ecosystem products. Sudan Biodiversity National Targets, states that by 2020, more of terrestrial and inland water areas, and coastal and marine areas, especially areas of importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures and integrated into the wider landscapes and seascapes.

WATERSHED AND HYDROLOGICAL SERVICES

The forests of Sudan help protect the watersheds of the country and influence the quality, quantity, and seasonal flow regimes of water in the country's rivers. These effects depend on factors such as slope, amount of precipitation, fog or cloud moisture capture, evapotranspiration from forest vegetation, soil type, rain shadow effects, and other physical factors. The Nile Basin Initiative has assisted Member States to prepare for the implementation of livelihood-based watershed management programs in the Blue Nile Basin in Ethiopia, Sudan and Egypt that has registered impressive results, focusing on soil and land management, soil and water conservation, and the management of wetlands of trans-boundary significance. Investment programs have also been prepared to restore forests, representing key catchment for the river systems.

CARBON SEQUESTRATION

Forests remove carbon from the atmosphere and store it in their biomass. This has obvious economic value if it mitigates costs predicted to result from CO -induced global climate change. Global markets that value and trade this sequestered carbon are developing slowly. These markets currently are mainly voluntary, followed by more regulated markets under Kyoto United Nations Framework Convention on Climate Change "architecture". A number of the key informants of the assessment stated that Sudan should prepare to take advantage of these markets, in order to also take advantage of economic incentives to conserve and restore its forests through this type of global payment for ecosystem services mechanism.

NON-MATERIAL BENEFITS

In addition to providing direct material benefits to humans in the form of ecosystem products, and indirect material benefits in terms of ecosystem services, natural ecosystems and species also provide a range of non-material benefits that are important to human well-being and development. These include historical, cultural, spiritual, recreational, educational, and scientific benefits.

TOURISM

Tourism is a prospective contributor to Sudan's economy, and terrestrial and marine biodiversity are key inputs into Sudan tourism. The expenditures of tourists at wildlife reserves and national parks, while only a small part of overall tourism expenditure, can safely be regarded as dependent on biodiversity. Many of the strategies for encouraging conservation of terrestrial wildlife depends on local communities earning revenues from tourism, so they will have a financial incentive to protect wildlife and natural habitats.

V. LEGAL FRAMEWORK AFFECTING CONSERVATION

5.1 NATIONAL LAWS, POLICIES, AND STRATEGIES

5.1.1 THE INTERIM NATIONAL CONSTITUTION OF SUDAN

The Interim National Constitution of Sudan (2005) contains articles that are relevant to the environment and natural resources, particularly Article 11, which declares that, "The people of Sudan shall have the right to a clean and diverse environment; the State and the citizens have the duty to preserve and promote the country's biodiversity." The article also declares that the State promotes sustainable utilization of natural resources and best practices with respect to their management through legislation. The article specifically states that, "The State shall not follow policies or do or allow any action that may have a negative effect on the presence of any animal's diversity or their natural habitat." Further, the Constitution radically changes the relative authority of the various actors and stakeholders in the field of environment by transferring significant powers from the national to the state level.

5.1.2 THE ENVIRONMENT PROTECTION ACT & SECTORAL ACTS

The Environment Protection Act (2001) is policy-oriented framework legislation for the protection of the environment and natural resources in Sudan. The Act includes a provision on compliance with international conventions. Additionally, Section 17 under Chapter 3 calls for conducting an Environmental Impact Assessment for projects that might adversely affect the environment. Section 18 of the Act stipulates certain directives to guide the activities of various concerned authorities, which are detailed in Annex 5.

There are a number of sectoral acts in Sudan dealing with matters related to different biodiversity terrestrial, freshwater and marine components listed in Annex 5. Furthermore, the Sudanese Fishery Ordinances and Regulations prohibits over-fishing, dumping of refuse, including oil, into the sea and the collection of corals, shells, and aquarium fish. These date back to 1937 and were amended in 1975 and 1978. However, none of the members of the aquatic fauna and flora enjoys legal protection status.

Despite the fact that range resources are used in common and livestock moves within different states, and even beyond the international boundaries, still range use is regulated through local orders issued at state levels in some states. There is no legislation that organizes the utilization of the range resources at the national level. The few articles that tackle the issue of range resources are fragmented within different legislations, and not compiled under one law. Regulations related to land acquisition and ownership and grazing rights are found in Land Laws while some of the regulations related to range protection are embedded in Investment and Forest laws. Due to absence of clear-cut national comprehensive laws, the range resources are misused and grazing areas are not definite. This caused the rangelands to be diverted to other kind of investment forcing the pastoralists to seek grazing outside the normal pattern, which may lead to conflicts.

5.2 INTERNATIONAL AND REGIONAL AGREEMENTS

With regards to plant agro-biodiversity, Sudan is a party to the International Treaty on Plant Genetic Resources for Food and Agricutlure (ITPGRFA) as well as a signatory to the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilization to the Convention on Biological Diversity. As for wildlife, freshwater, and marine biodiversity, Sudan is party to a number of global and regional multilateral agreements of relevance to conservation and sustainable use of wildlife, fresh water, and marine biodiversity, which are listed in Annex 5.

In addition to the international conventions of relevance Sudan is also a party to a number of regional conventions related to environment and natural resources issues, including the African Convention on the Conservation of Nature and Natural Resources. It is also a party to the Regional Convention for Conservation of the Red Sea and Gulf of Aden (1982). The objective of the latter convention is the rational exploitation of marine species, coral reefs and coastal natural resources in order to achieve sustainable development for the present and future generations. Additionally, Sudan has been a party to the Convention on Biological diversity (CBD) since 1995, and acceded to the Cartagena Protocol on Biosafety since 2005. Sudan did not sign the Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress.

Two protocols were signed by Sudan in 2005: The Protocol Concerning the Conservation of Biological Diversity and the Establishment of Protected Areas; and the Protocol Concerning the Protection of the Marine Environment from Land-Based Activities in the Red Sea and Gulf of Aden'. A third protocol was signed by Sudan in 2009, namely The Regional Protocol concerning Technical Cooperation in Burrowing and transferring experts, technicians and equipment in marine emergency.

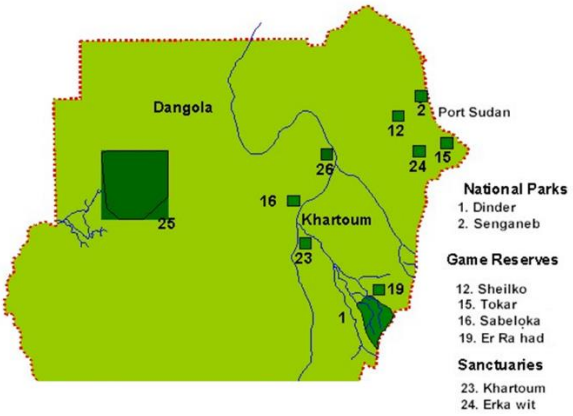

FIGURE 2 - GAME RESERVES AND NATIONAL PARKS OF SUDAN

5.3 GOVERNMENT AGENCIES

The Ministry of Agriculture is the focal point for the ITPGRFA. The Higher Council for Environment and Natural Resources (HCENR) within the Ministry of Environment and Physical Development is the national focal Point for Cartagena Protocol, and the National Focal Point for the Biosafety Clearing House (BCH), that liaises with the Secretariat of the Biosafety Protocol with regard to issues of relevance to the development and implementation of the BCH. According to the law, the National Biosafety Council is the Competent National Authority, and it was established in May 2012, as the consultative and executive body in the country in respect to biosafety related matters. It is under the supervision of the Minister of Environment. A Biosafety Technical Committee should work under the National Biosafety Council.

5.4 CONSERVATION INITIATIVES: GAP ANALYSIS

Policy and investment responses are fragmented and inadequate. Federal, state and local governments and their constituencies are overwhelmed by the scale and complexity of the problems confronting production and conservation landscapes. Attempts within most tiers of government to address these problems have generally been ineffectual in the face of the following challenges: (a) lack of sufficient financial resources; (b) unclear and overlapping mandates of institutions responsible for various components of the rural landscape; (c) insufficient technical capacity in these institutions; (d) insufficient knowledge and outdated data to address such complex issues; (e) absent or weak land-use planning; (f) limited research capacity; (g) weak regulatory compliance and enforcement; (h) weak community involvement in prevention and restoration activities; (i) insufficient attention to alternative livelihood issues; and (j) insufficient attention to transparent governance, corruption, and local participation. The different challenges are interwoven and require integrated solutions. The fragmentation of institutions, information, and incentives weakens the ability of government institutions and the communities that they serve to address the issues in a strategic and integrated manner.

VI. THREATS TO BIODIVERSITY (INCLUDING TROPICAL FORESTS)

6.1 DIRECT THREATS TO BIODIVERSITY

Habitat loss and fragmentation is considered the primary threat to biodiversity and conservation of endangered species. In Sudan, the deliberate policy of subdividing land traditionally held in common, and accessed for its different resources by pastoralists, wildlife, and smallholder farmers, is furthering the "expected" process of fragmentation and restricted access for each of these stakeholder groups even more rapidly leading to loss of fertility and soil erosion.

Soil erosion is increasing in those areas being converted rapidly from vegetative cover to agricultural land. Degradation of biodiversity is most commonly attributed to overgrazing, over hunting, tree felling and soil erosion and an overall environmental degradation process. It is also a result of the lack appropriate legal framework that leads to proper utilization and wise use of natural resources. Lack of a clear land use policy is emphatically mentioned by authorities as basic cause. Recurrent droughts, floods, temperature, and bush fire all threaten biodiversity.

6.1.1 THREATS TO FOREST RESOURCES

If the pace of change and loss continues as today, the severity of threat to forest ecosystems and plantations is very severe indeed – leading to possible disappearance. Disappearance, however, is not the only difficulty with forest loss – there are inevitably also impacts on related ecosystems to consider. Through erosion and increased sedimentation of waterways, water catchment stability is the biggest potential impact on downstream ecosystems. Connections with energy needs in Sudan are a significant factor in deforestation and demand for wood products and are inadequately addressed in the forestry sector.

Deforestation and forest degradation are in fact the major threats to the forestry development in Sudan. Information on forest cover and biomass changes and deforested areas obtained from successive inventories and remote sensing images carried out in 1990, 2000, 2005, and 2010 by Global Forest Resource Assessment (FRA) indicated that the forest area declined from 76.4 million ha in 1990 to 70.0 million ha by the end of 2009. The on-going process of environmental degradation is a critical issue that affects the livelihoods of a large sector of the population. Removal of tree cover for crop production, felling trees for fuel wood and building poles, in addition to overgrazing are factors that, together with drought conditions, resulted in desertification and consequently, shortage in food crops, and loss of soil fertility. People's awareness about the critical situation and its future consequences and the importance of tree planting and protection is vital for their involvement in the protection and rehabilitation of the environment. It is also proving to be more forceful and apparently sustainable when it is of an income generating nature (FAO, 2013).

6.1.2 THREATS TO WILDLIFE AND BIODIVERSITY

Factors threatening the genetic diversity of agricultural crops in the Sudan are many including natural and human factors. These threats include environmental changes such as the drought spells and fluctuations in rains, floods and temperatures; expansion in modern agriculture and use of advanced improved cultivars in a mono-cropping system of agriculture, and expansion in new developmental constructions and activities within the country.

The wide variety of vegetation types in the Sudan is reflected in its fauna. Setzer (1956) reported that 91 genera and 224 species and sub-species of mammals other than bats have been described in the Sudan. It

is worth mentioning that out of the thirteen mammalian orders in Africa, twelve occur in the Sudan. Cave (1958) stated that 871 species of birds were recorded in the Sudan. There are only a few references on current distribution of wildlife in Sudan. The disappearance of wildlife from many areas during the last few decades has not been documented or evaluated, and current changes in wildlife abundance and distribution are not known or appreciated. The status of wildlife conservation in Sudan is unsatisfactory. Deterioration of wildlife habitats is occurring at an alarming rate. Competition with other land-uses is affecting many of the wildlife habitats.

Desert encroachment is affecting an area of 650,000 km² lying between Lat. 12°N and 18°N and along the Nile strip northwards up to the border with Egypt and between longitude 22°E and 34°E. The problem of desert encroachment has been attributed to man induced factors and climatic changes. The land use system in areas affected with desert encroachment is a multipurpose one with various conflicting interests. There is generally no integration between pastoral and arable activities. Another important point is that because of the traditional technology used for agricultural production in many areas and low incomes of the farmers, the main channel for saving and investment is livestock ownership. It follows that overstocking with rather poor offtake, coupled with increasing human population has led to tremendous pressures on the land. The land in many areas has been overworked, depleted and abandoned and new areas are subjected to a similar pattern of use.

The public's attitudes toward wildlife in Sudan are the result of lack of education about the Sudanese wildlife. All the urban areas of Sudan have lost most of their wildlife. Wildlife presence is restricted now to remote areas.

6.1.3 THREATS TO COASTAL AND MARINE ECOSYSTEMS

Marine ecosystem is facing several threats that could be listed as below:

i. Increases in tourism activities along the coast puts pressure, and increase the threats from roving fishers seeking higher-level predators (such as grouper and sharks) and disrespecting territorial boundaries. Insufficient technical and management capacity for tourism development continues to exist in Sudan.
ii. There is severe over-fishing for sea cucumbers in the vicinity of Dungonab Bay where sea cucumbers have been fished out from many shallow areas forcing divers to travel further and exploit deeper waters (PERSGA/GEF 2004f). Similarly, the mollusks *Trochus* spp., *Strombus* spp., *Lambis* spp., and *Murex* spp. have been severely fished. Most individuals of these species observed in the wild are small and occur at low densities (PERSGA/GEF 2004f).
iii. Most mangrove stands are affected, at various levels of severity, by camel grazing, felling and limb cutting. Current levels and types of use within the coast appear, with only a few exceptions, to be causing little damage. The few exceptions include: a declining dugong population due to the use of fixed nets in sea-grass areas and on migration routes; heavy overfishing of some areas and some groups; unsustainable targeting of important breeding aggregations of some fishes in addition to those impacts associated with tourism activities namely anchor damage (African Park Foundation, 2006).
iv. Several 'natural' impacts were also observed, including the effects of coral bleaching, diseases, sediments, boring sponges, corallivorous snails (*Drupella* sp.), and the Crown-of-Thorns starfish (*Acanthaster plancii*) (African Park Foundation, 2006).

6.1.4 THREATS TO FRESHWATER

The single most critical issue related to water resources in Sudan today is the new and planned large dams and related development schemes. A number of other issues were also noted in the course of the assessment. These include:

- Traditional dams;
- Wetland conservation;
- Invasive plant species;
- The watercourses of Sudan are afflicted with two invasive species: water hyacinth, which threatens the Nile basin watercourses, and mesquite, which has infested many of the seasonal khors and canals irrigated schemes.
- Water pollution;
- Groundwater exploitation;
- Transboundary issues and regional issues; and
- Freshwater fisheries.

The situation with existing dams in Sudan can be used as a benchmark to help evaluate the balance of benefits and disadvantages of the country's proposed future dams (next section). UNEP visited all of Sudan's existing large dams: Jebel Aulia on the White Nile, the Sennar, and Roseires dams on the Blue Nile, and the Khashm el Girba dam on the Atbara River.

For Sudan, the development benefits of large dams are very clear: They provide most of the electricity in the country and support large-scale irrigation projects. As such, they can be considered a cornerstone of development for the country. However, like most major water and infrastructure projects, large dams also have a range of negative effects, including environmental impacts. All of the dams visited by UNEP were found to have both performance problems as visible, through variable, negative impacts on the environment.

Much of the issues noted are irreversible and possibly unavoidable. Nonetheless, they provide important lessons that can help minimize negative impacts of future dam projects through improved design and planning. UNEP's inspection of existing dams highlighted two principal environmental issues:

- Performance problems caused in part by upstream land degradation; and
- Downstream impacts due to water diversion and changes in flow regime.

6.2 DRIVERS OF THREATS

This assessment employed the "threats-based approach" to biodiversity conservation that guides USAID's biodiversity programming as the conceptual framework for our analysis. Using this logical framework, to identify the direct, biophysical threats to biodiversity in each of the major ecosystems of Sudan, including the five main types of direct threats to biodiversity recognized by conservation biologists, as follows:

- Conversion, loss, degradation, and fragmentation of natural habitats;
- Overharvesting or overexploitation of species;
- Introduced non-native species that harm native habitats or species;
- Pollution or contamination that harms natural habitats or species; and
- Macro-environmental change, such as climate change, desertification, or disruption of
- Natural disturbance regimes (such as floods or fires).

The causes, direct or indirect, can generally be described as one of three types:

- Social causes (related to, for example, cultural beliefs, lack of awareness, information, science, or technology);
- Political, institutional or governance causes; and
- Economic causes.

While water pollution is clearly a significant issue in Sudan, it has not been adequately quantified. Indeed, the sector is characterized by a lack of historical data and investment. Systematic surface water quality monitoring programs in Sudan are limited to three sites: the main Nile at Dongola, the Blue Nile at Soba (near Khartoum), and the White Nile at Malakal. Other sites and groundwater are tested at on an ad hoc basis.

On a national scale, Sudan makes limited use of its groundwater, but it is a critical resource at the local level, particularly in the northern and central regions, and in Darfur. Data on the use and quality of groundwater, however, is collected and extraction is generally completely unmanaged. There is anecdotal evidence of unsustainable extraction rates in the areas to west of Omdurman and in the Nile and Northern States for irrigation of fodder crops for export, but in the absence of monitoring data, the situation only becomes apparent when the wells run dry.

Observers say the level of threat, while not yet devastating, will soon become so if measures of improved protection are not put in place today. The difficulty in coordinating between governmental and donor agencies involved in the various aspects of watershed management for instance increases the potential inherent in this threat, as it may end in years of delay before actions are taken.

The Sudanese marine and coastal environment is in relatively good condition overall, with isolated badly degraded areas. The region, however, is subject to a mounting list of environmental impacts linked to urban and industrial development, and to overgrazing.

The damage to coastal habitats due to construction within this strip is extensive and in some cases both completely unnecessary and probably uneconomic in the long term. In some areas such as the main commercial port of Port Sudan, habitat destruction is unavoidable: though regrettable, local environmental damage is outweighed by the scale of the economic benefit. In other cases, the benefits are questionable.

VII. ACTIONS NECESSARY TO CONSERVE BIODIVERSITY (INCLUDING TROPICAL FORESTS)

Some opportunities for USAID/Sudan to consider in its planning and implementation are laid at this section, as suggestions from key informants and recent studies were collected as a normal part of the interviews and research. The ideas come in broad lines that the Mission may use in identifying possibilities for new efforts when needed.

Some of these approaches are already being planned or implemented on a limited scale by various government agencies, donors, NGOs, or local groups. This document should inform the Mission's choices as to the opportunities presented below. Many approaches were identified in The National Biodiversity Resource Mobilization Plan 2015 -2020 For Sudan, August 2014, and similar documents. Nevertheless, they stood out as issues that need further examination and action. These ideas are closely linked to the trends, threats and constraints identified in the above sections, but presented together in this section for ease of reference.

Ecosystem	Threats	Causes	Actions Needed
Terrestrial			
Savanna Forests	Loss, fragmentation, and degradation from: • Agriculture expansion (smallholders, large commercial enterprises) • Illegal logging, charcoaling, firewood collection	• Unclear land tenure and conflict over land, including ethno-political conflict • Illegal land use changes • Lack of comprehensive land use planning • Inadequate public understanding of the value of savanna biodiversity / ecosystems to provide ecosystem services (e.g. hydrological services) • Lack of equitable access to economic opportunities for sustainable livelihoods in forest areas	• Regulate and clarify land tenure • Enforce land law and stop irregular/extra-legal land allocation • Develop comprehensive plan for conserving watershed forests and allocating water • Conduct policy-relevant research on eco-hydrology of all major forests • Raise public and parliamentary awareness of forest biodiversity and hydrological services • Improve equitable access to economic opportunities • Improve conservation-friendly land uses on private and community lands • Improve co-management mechanisms on public lands
Montane/Coastal Forests	Loss, fragmentation, & degradation from: • Agricultural expansion (small and large scale) • Illegal logging, charcoaling, firewood collection • Snares for bush-meat actually harvest a range of forest species	• Insecure land tenure for traditional coastal communities and irregular/extra-legal land allocation • Lack of on-farm trees for construction materials • Lack of sustainable charcoal/cooking fuels	• Secure land tenure for traditional coastal communities and stop irregular/extra-legal land allocation • Support small-scale farm forestry/agroforestry • Develop/promote alternatives to charcoal/firewood and fuel-efficient stoves
Marine			
Coral Reefs	• Overfishing of reef species • Destructive fishing practices	• Undefined/poorly defined marine resource tenure	• Regularize marine resource tenure and expand traditional

Ecosystem	Threats	Causes	Actions Needed
	(e.g., dynamite, poison, small-mesh nets, beach seining) • Sedimentation from onshore activities • Destruction and degradation from development of port infrastructure • Coral bleaching & damage from global climate change (warming and ocean acidification)	• Marine resource management agencies lack enforcement systems & capacity (boats, fuel, patrol staff) • Upstream agricultural practices cause soil erosion to rivers • Climate change from unsustainable global fossil fuel economy	systems & locally-managed marine areas • Provision of adequate support by GOS to fulfill enforcement mandates • Conduct Strategic Environmental Assessment for Sawakin Port and make findings public • Support further scientific research on reef resilience to sea warming and acidification in • Develop comprehensive strategy for coral conservation involving stakeholders
Mangroves	• Cutting – legal but unmanaged, and illegal • Destruction and degradation from development of port infrastructure	• Lack of ecological information for sustainable management • Lack of comprehensive mangrove strategy for Sudan or the region • Lack of systems and capacity for management and enforcement	• Develop ecologically-based management plans for major mangrove areas • Develop and implement comprehensive mangrove conservation and management strategy
Coastal	• Habitat degradation from tourism infrastructure and other development	• Insecure land tenure for traditional coastal communities and irregular/extra-legal land allocation	• Secure land tenure for traditional coastal communities and stop irregular/extra-legal beach-front land allocation

VIII. EXTENT TO WHICH THE MISSION MEETS THE IDENTIFIED ACTIONS NEEDED

USAID/Sudan is working towards meeting some of the needs identified, through its portfolio of environment and NRM activities. USAID/Sudan's strategic plan supports programs in health, democracy and governance, agriculture, and natural resources management. Through careful activity design, synergies between them will ensure environmental sustainability of the Mission's program as it is implemented over the next few years. Most important in this regard are the programs in agriculture and biodiversity conservation. The Mission's agriculture support program is usually worked out to detail its underlying approach to environmental – and closely related social – sustainability issues. The biodiversity program takes a tested, community-based approach that encompasses some forest conservation as well. Lack of staffing and financial resources; however, restrain all Mission programs, limiting its ability to respond comprehensively to environmental protection.

Currently, USAID/Sudan proposed to implement a pilot project in Northern Darfur under, the USAID Toward Enduring Peace in Sudan (USAID/TEPS) project, focusing on strategic objectives to improve:

1. Intra and inter-state relations at the community level;
2. The resilience of communities to withstand social and economic shocks

This plan of the project proposes a variety of adaptation options and interventions that are designed to reduce conflicts, increase community resilience and enhance local natural resources management capacity. The Plan is also aiming to create conducive conditions for peace and help normalizing inter-society relations and removal of major causes of conflict.

Table 1: USAID Sudan Sample Project Site Specifications

Project sites specifications
Locality: Millet (14°00 - 14°30' N and 25°30' - 26°00 E) Aramal village council: (includes 5 village cluster) 25 km South East of Millet town (Millet town 68 km North from El-fasher town, capital of the state) Population: about 400 households
Locality: Umkadda (13°00 - 14°00' N and 26°00' - 27°00 E) Abuhimera village council: (includes 5 village cluster) 30 km south of Umkadda town (Umkadda town 162 km East from El-fasher town, capital of the state) Population: about 1300 households

To select specific sites and appropriate and interventions, a field survey was carried out by the study team during the period 15-25 March 2017.

Intensive bottom-up consultative processes at the state, locality and community levels were conducted. Meetings and focus group discussion were conducted with government institutions and departments, NGOs, native administration leaders and the target communities. Based on this consultative process, two sites were selected in North Darfur State. Sites specifications are shown in the box above.
Some of the actions needed that USAID contributes to include:

The thematic priorities identified in the assessment suggest some areas of cross-sectoral overlap between the actions necessary for biodiversity and forest conservation and the proposed objectives of USAID Sudan's Democracy and Governance (DG), Education and Youth, Health, and Agriculture,

Business and Environment programs. The thematic areas of devolution, decentralization, and CBNRM, as well as policy and legislative reform, ought to link closely with the Democracy and Governance objectives of the Mission. There are large opportunities for synergy between USAID's NRM and DG programs related to managing and mitigating land and natural resource conflicts. The livelihoods and economic opportunities theme likewise should synergize with objectives of the agriculture, competitiveness, and food security aspects of the Mission's portfolio. Public education and NGO advocacy link logically with Education and Youth, as well as DG objectives.

The geographic focus proposed for the Mission's programs shows some overlap with areas that are among the highest priorities for biodiversity and tropical forest conservation. One such area of overlap is in the western Sudan. The hydrological linkages between forests and agriculture are of critical importance, and a better understanding of these linkages will be important in designing and implementing specific activities. Another area of geographic overlap between biodiversity conservation priorities and other priority areas occurs in the dryland savanna ecosystems.

Several development goals promoted in the Government of Sudan's (GOS) Vision have significant potential to harm ecosystems and species unless properly carried out, including mining and oil and gas development, development of cities, and construction of dams. Many of the key informants raised concerns about the proposed development of the Sawakin Port and mega dams projects. The Assessment Team sees this as a prime opportunity for USAID to engage with the GOS in developing and promoting the use of modern environmental planning measures, such as the use of Strategic Environmental Assessments (SEA). For example, if USAID/Sudan were asked to assist the GOS in developing an agricultural strategy, the Mission should insist on a SEA as a first step in the process, and build capacity of the relevant GOS agency, to conduct a transparent and participatory SEA that meets international standards.

Forestry programs, such as the REDD, generally are helping regularize and clarify land tenure, supporting enforcement of the land law, and trying to stop irregular practices. Those programs are also working to improve conservation, restoration, and management of native forests and watersheds.
In savannas and bushland, USAID may contribute to: maintaining or restoring corridors for wildlife movement; transforming traditional pastoral tenure and dispute resolution mechanisms through improved communication; increasing systems and capacity for anti-poaching control; and diversifying economic opportunities in pastoral areas through increased tourism, handicrafts, commercial meat sales, beekeeping, and bio-enterprises for native plant products.

On the coast of Sudan, USAID may support actions that address the need for secure land tenure for traditional coastal communities and work to stop irregular practices.

IX. RECOMMENDATIONS

9.1 RECOMMENDATIONS BASED ON ACTIONS NECESSARY TO CONSERVE BIODIVERSITY (INCLUDING TROPICAL FORESTS)

The assessment of actions necessary starts with a review of recent sources that present the views of the Government of Sudan on this topic. These are well expressed at the following:

1. The project supporting the implementation of the CBD 2011-2020 Strategic Plan in Sudan, sponsored by the Global Environment Facility (GEF) with Partnership of the United Nations Development Program (UNDP), and the Ministry of Finance and National Economy (Sudan). It was implemented by the Higher Council for Environment and Natural Resources (HCENR) in Sudan (2013-2015). The project's objective to integrate Sudan obligations under the Convention on Biological Diversity (CBD) into national development and sectoral planning framework through a renewed and participative biodiversity planning and strategizing process, in manner that is in line with the global guidance contained in CBD 2011-2020 Strategic Plan of the Republic of Sudan.
2. The Report on the National Biodiversity Planning to support the Implementation of the CBD 2011-2020 Strategic Plan in Republic of Sudan: Stocktaking and National Biodiversity Targets Setting, was prepared by a working group of national experts, Khartoum 2013. The report aimed at identifying the national priorities for conservation, sustainable use and management of biodiversity.
3. Sudan's Country Report on the status of the biodiversity contributing to The State of the World's Biodiversity for Food and Agriculture (SoWBFA) is based on the request of the Food and Agriculture Organization (FAO) of the member countries in the commission on genetic resources for food and agriculture, to prepare such report. Countries were advised to consider the Guidelines prepared by FAO, to assist countries in preparation of their reports that are eventually contributing to the SoWBFA, with the state and trend of crops, forest livestock, fisheries and aquaculture sectors. Also, about associated biodiversity comprises, microorganism, invertebrate, vertebrate and wild and aquatic plants. The report also described the use of biodiversity in food and agriculture for food security, nutrition, and rural livelihoods. Further the report suggested the future agendas for conservation and sustainable use of the biodiversity for food and agriculture.

The recommendations below emerged from analysis of the information presented above. At the first level of analysis, information about the severity and extent of threats to the various ecosystems of Sudan requires certain priorities for conservation.

CROSS-CUTTING OPPORTUNITIES

1) Changing attitudes about the roles and benefits of natural resources, including wildlife

A key issue is the need to build on increased visibility at the community level and the acceptance gained in certain communities where wildlife management is a concern. Similarly, there is an excellent opportunity to build on increased media and public attention, through social marketing research and environmental education campaign in support of program goals: adoption of available technologies, advocacy on environmental issues, etc. From the other side of the coin, seeking new perspective on the validity of community resources management and windows of opportunity to build on. Knowledge and awareness may make forward movement, with adequate additional education much easier, if done properly.

2) Integrated land use planning

Key informants raised the concept and tool of integrated land use planning frequently. Environmental programs can have a greater impact when awareness of wildlife habitat and corridors, intensive and extensive agricultural use, forests, watershed protection, etc. are assessed in a holistic manner by stakeholders. Additionally, this approach can facilitate integration of work between Ministries for each sector, including environment, agriculture, economic development, and social issues, which can have a positive impact on program results.

3) Documenting linkages between sectors

This is important particularly between economic development and natural resource degradation. USAID guidance notes that where factors such as rapid environmental degradation (1 percent/year or more), severe economic loss (5% of GDP), or severe environmental health risk are present, USAID may give serious consideration to programmatic interventions that seek to address their root causes.

4) Supporting systemic change in Sudan

No one agency can usually accomplish major shifts in policy or societal attitudes. However, enabling conditions are required to allow more specific interventions to occur, well documented as a necessity for turning the tide. In Sudan, population pressures, poverty, political logjams, mismanaged public sector resources, and inadequately documented degradation trends or other research are the most commonly referenced constraints.

WILDLIFE AND TERRESTRIAL BIODIVERSITY RESOURCES

1) Building on community-based wildlife and other natural resource management

Building on community-based programs, through strategies that allow communities to see the benefits of wildlife and other non-farm land uses, is vital. For example, ecotourism, wildlife cropping, small-scale Natural Resources-based enterprise development, and other alternative strategies that directly link protection and income are important to changing attitudes of communities near protected areas. This sector is where USAID/Sudan's comparative advantage lies.

2) Linking biodiversity to other sectors

Biodiversity conservation is documented to be more successful when practiced in the context of other factors. USAID and other donors are addressing economic need through CBWM programs, but few programs link health, education, culture, and other human elements into their work. Development organizations tend to have a more positive impact than conservation organizations, when leading project alliances. This is due to development organizations' greater focus on solving the needs of humans, whence come threats to biodiversity and other resources.

FRESHWATER AND COASTAL RESOURCES

1) Developing incentives for protection

A range of options for protection is needed in this sector, as many freshwater wetlands are privately owned and no one approach will work for them. Incentives are needed for landowners, but also for communities, industry, agricultural interests, etc.

2) Supporting policy improvements and research on wetland ecosystem health

Much support needs to be given for the draft wetlands policy, and for increased research and monitoring of wetlands and watershed health. The parties concerned has a solid base of knowledge and needs external support and legal authority for extending that beyond protected areas and to pulling together integrated planning processes for watersheds, etc. that involve more than one ministry or donor agency. Research bodies also need much more support for monitoring ecosystem health and doing studies on impacts and their sources.

3) Replanting and establishing nurseries for mangrove afforestation
Coastal areas are vulnerable to erosion and fisheries depend in many areas on mangrove ecosystems as nurseries for fry. Sudan's loss of mangroves is high and there is urgent need to increase replanting and establishing local nurseries; this could be an income-generating activity for communities in coastal zones.

4) Considering inland aquatic tourism
Developing this type of venue for ecotourism through community – managed projects is an opportunity that has yet to be fully exploited.

5) Supporting integrated water resource management
USAID and other donors are mandated to support and plan IWRM activities, in and around several key areas. Community-based projects in *inland* biodiverse areas can also integrate water and wetland management into community NRM and land use planning processes as part of the local agroecosystem.

FOREST RESOURCES

1) Replicating community-based successes
This sector, closely linked to the biodiversity sector, produced concrete suggestions for improvements, including the need to replicate community-based successes. Local communities may establish management committees to monitor vegetation cover in the district, to ensure that sustainable use levels are maintained and prevent harvesting of live trees.

2) Providing strong support for agroforestry, NTFP development, and community woodlots
To relieve the heavy pressure on Sudan's tiny percentage of forested lands, focus on developing alternative sources of wood products and energy sources for domestic use is important. Few donor projects are actively implementing agroforestry or plantation improvements. Some are conducting research, but as noted above, that is insufficient to make a change in terms of forest protection and maintenance. Also needed are alternative species for use as fuelwood, such as the newly developed eucalyptus variety that requires little water and nutrients; stoves that fulfill all perceived needs of local people as well as cook more efficiently; food and medicinal species; etc.

3) Reducing poverty
Researchers in the forest sector in Sudan point repeatedly to poverty alleviation as a key to reducing pressure on forests. Alternative fuel, food, and other resources and income-generation activities are needed, such as: beekeeping, butterflies, mulberries for silk, and the use of alternative woods for carving.

AGRICULTURAL RESOURCES AND LAND USE

1) Establishing clear policies and educating people about appropriate land tenure and land use.
Opportunities in this field require widespread coordination within and among Sudan institutions and the donor community. The causes of trends in land subdivision and rural-urban migration, and the impacts of those trends on agricultural productivity and environmental degradation must be well understood. Working locally to promote sustainable land use and tenure regimes is also important.

Community-based NRM and land use planning is a key component of providing examples and promoting more systemic change. Several organizations have supported such approaches with success in that they helped build local awareness of biodiversity and how the regions surrounding protected areas are

important to conservation. Planning for enterprise development activities based on NRM will also provide an alternative for group farmers involved in considering the subdivision/conversion cycle.

2) Working on dryland issues

Transboundary conflict over cattle and other resources, capacity-building for NGOs and local governments in arid districts, strengthening levels of food security and reducing vulnerability to drought are the most important issues.

9.2 OTHER OPPORTUNITIES

9.2.1 PRIORITY AREAS

The proposed priority ecosystems and priority themes can be arrayed in a matrix to be used as a conceptual framework for designing strategies and programs to conserve biodiversity and tropical forests in Sudan. Analysis of the threats, causes, and actions necessary for conserving Sudan's biodiversity and forests led the assessment team to identify these major ecosystems as high priorities for action.

The dynamic ecological mosaic of savanna grassland, woodland, and bushland in the Arid and Semi-Arid Lands of Sudan stand out as high priority for conservation because:

- They cover approximately 80% of the country;
- They are threatened with loss and degradation from unsustainable grazing and fragmentation caused by corridors for large-scale movements of both wildlife and livestock;
- These ecosystems support the big, charismatic mammals that are a major factor drawing international tourists to Sudan;
- They also support traditional pastoral communities who live in areas unsuitable for significant crop production.
- These forests are the ecosystem with the greatest percentage of total area loss of any ecosystem in Sudan, with only about less than 10% of their original coverage remaining;
- Savannah forests provide irreplaceable ecosystem services at the national level, as the watershed catchments for all the rivers of Sudan, and have higher potential for carbon sequestration than any other ecosystem; and
- The demand for agricultural land, and conflicts over it, still threaten even the remaining small fraction of this ecosystem.

The ecosystems of Sudan's coastal and marine zone, from its beaches, mangroves, and coral reefs stand out as a high priority for conservation because:

- This zone accounts for a large proportion of the species in Sudan, although it is much less studied than terrestrial ecosystems;
- The ecosystem services of this zone, nutrient cycling, and the protection of the coast, are irreplaceable and undervalued;
- Coastal natural resources support the livelihoods of coastal communities, and there is lack of information for access and use rights; and
- The living resources are almost unmanaged and are not contributing nearly what they could to the country's well-being.

The coastal forests are a high priority for conservation action because:

- They contain an unusually high proportion of endemic species of plants and other taxa;
- They are now highly fragmented and are still being degraded;

Content analysis of the identified "actions necessary" leads to the recommend the following five thematic areas as the highest priorities for biodiversity and forest conservation in Sudan:

- Regulated and steep devolution, decentralization, and community-based natural resources management
- Land and Natural Resources Management (NRM) policy and legislative reform to create the enabling environment for community-based natural resources management (CBNRM) and biodiversity-based economic opportunities
- Enhanced livelihoods and economic opportunities
- Applied science, environmental information, and monitoring
- Public awareness and education and capacity of NGOs for advocacy

9.2.2 OPPORTUNITIES FOR CROSS-SECTORAL LINKAGES IN PLANNED USAID/ SUDAN ASSISTANCE PORTFOLIO

The thematic priorities given above suggest some areas of cross-sectoral overlap between USAID/Sudan's NRM objectives and those of the Democracy and Governance, Education, Youth, Health, Agriculture, Business, and Environment programs in Africa. The thematic areas of devolution, decentralization, and CBNRM, as well as policy and legislative reform, ought to link closely with the Democracy and Governance objectives of the Mission. They also cover the livelihoods, economic agriculture, competitiveness, and food security aspects of the Mission's portfolio. Public education and NGO advocacy link logically with Education and Youth, as well as DG objectives.

9.2.3 RECOMMENDATIONS FOR AVOIDING NEGATIVE IMPACTS ON BIODIVERSITY

A number of the development goals promoted in GOS Vision for the near and far future, have significant potential to harm ecosystems and species unless properly carried out, including mining and oil and gas development, development of resort cities, construction of transportation corridors and by-pass roads. In particular, many of our key informants raised concerns about the proposed development of the Sawakin Port and the States mishandling National Forests. One clear "action needed" was stated as: "Need transparent information on plans for Sawakin Port and The States forestry actions.

The Assessment Team learned that the HCENR and the Ministry of Environment and Forestry are taking the lead in assessing the social, ecological and economic impacts of the development programs, with support from the international organizations. A higher-level, "strategic" environmental assessment is needed to look at potential large-scale, indirect environmental impacts of a development policy, strategy, or large- scale plan. The case of the Sawakin Port and the States Forests seems to the Assessment Team to be a clear example of a situation in which a Strategic Environmental Assessment is needed. Without taking the large-scale, long-term view, some of USAID Sudan's activities may have the potential for unforeseen negative effects on biodiversity.

ANNEX I: SCOPE OF WORK SUDAN ENVIRONMENTAL THREATS & OPPORTUNITIES ASSESSMENT

I. OBJECTIVE

To hire a short-term institutionally contracted national staff to report directly to USAID for daily tasks, and to be supported administratively by AECOM International. Specifically, the Environmental Specialist will conduct a country-wide assessment of biodiversity and tropical forestry conservation needs of Sudan and related issues for the purposes of complying with Sections 117, 118, and 119 of the Foreign Assistance Act of 1961, as amended, and Agency guidance on country strategy development, under ADS 201and ADS 204.

Based on this needs assessment, provide analysis of proposed actions under USAID/Sudan's new transitional strategy to identify how it contributes to the conservation needs identified. This Environmental Threats and Opportunity Assessment (ETOA) will also inform USAID/Sudan strategic planning, and provide a primary level of analysis on relevant proposed areas of programming, as well as address current Administrative and Congressional priorities.

Specifically, FAA Sections 118 and 119 require that all country plans include:
1. An assessment of the actions necessary in that country to achieve conservation and sustainable management of tropical forests (118) and conserve biological diversity (119); and
2. Analysis of the extent to which current or proposed USAID actions meet those needs.

Congress recognized the importance of biological diversity as the foundation of all sustainable development, and as critical to support, not burden, USAID programs. The ETOA is developed as a tool for not only informing the strategy development process, but is valuable throughout its full implementation. It assists in the identification of possible environmental compliance issues (positive and negative) associated with newly designed programmatic activities, as well as opportunities for innovative use of earmarked funding (especially for biodiversity and tropical forestry conservation), and increased sustainability across development sectors. The ETOA will help foster USAID/Sudan's capacity to achieve high-impact development and make smart use of our limited resources, supporting our leadership role in building and delivering development assistance excellence.

II. BACKGROUND

Policies Governing Environmental Procedures

USAID environmental compliance is directed by U.S. policy and law. The Foreign Assistance Act (FAA) of 1961, Section 117, requires that the President take fully into account the impact of foreign assistance programs and projects on environment and natural resources (Section 117 (c)(1)).

Section 118 states that each country development strategy statement or other country plan prepared by the U.S. Agency for International Development shall include an analysis of (1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.
Section 119 of the FAA relates to Endangered Species. It states that —the preservation of animal and plant species through the regulation of the hunting and trade in endangered species, through limitations on the pollution of natural ecosystems and through the protection of wildlife habitats should be an important objective of the United States development assistance (FAA, Sec. 119 (a)). Furthermore it states, —Each country development strategy statement or other country plan prepared by the Agency

for International Development shall include an analysis of (1) the actions necessary in that country to conserve biological diversity and (2) the extent to which the actions proposed for support by the Agency meet the needs thus identified (FAA, Sec. 119 (d)).

USAID/Sudan is currently developing a Transitional Strategy for its assistance program in Sudan. To be in compliance with above, and for USAID Sudan to effectively determine potential threats and opportunities associated with the management of natural resources and environmental factors, an assessment is needed to inform Mission Planning. The purpose of this Consultancy is to provide USAID/Sudan and the Government of Sudan with information and analysis to help achieve broad-based, inclusive economic growth and participatory democratic governance.

III. STATEMENT OF WORK

A. Core Assignment

The Consultant shall perform the following assessment activities:

- Get acquainted with existing background information on Sudan such as the country's natural resources, geographical, ecological and biological specificities, current status of environment and biodiversity, institutional organization on entity and state level, key stakeholders and donors in environment and biodiversity, legislation related to the environment and biodiversity, and other relevant information required for the assessment.
- Communicate via email and telephone with donor organizations, NGOs, relevant government agencies, and other organizations that are knowledgeable about biodiversity and tropical forestry conservation, environmental management, and/or are implementing related noteworthy projects, and gather information locally. This may include implementing partners supporting activities related to agroforestry, extractive industries management, sustainable eco-tourism, climate change vulnerability, renewable energy, water resources management, conservation agriculture, and environmental/public health.
- Assess and summarize the needs for natural resource and environmental management, especially biodiversity and tropical forestry conservation, in Sudan based on key threats, and analysis of country, donor and NGO responses to meet these needs. Prepare a report on the status of biodiversity, tropical forestry, and other priority environmental conservation efforts in Sudan, and potential implications for USAID or other donor programming and monitoring which shall define the actions necessary for improved natural resource and environmental management.

B. Assessment of actions necessary in Sudan to achieve conservation and sustainable management of tropical forests and conserve biological diversity

1. The **current status of biodiversity, tropical forests, and water resources** in Sudan based on current and available information.
2. **Major ecosystem types**, highlighting important, unique aspects of the country's biodiversity, including important endemic species and their habitats.
3. Descriptions of natural areas of critical importance to biodiversity conservation, such as forests and wetlands critical for species reproduction, feeding or migration, if relevant. Particular attention should be given to critical environmental services and non-commercial services they provide (watershed protection, erosion control, soil, fuel wood, water conservation and amenity and recreation).
4. An **overview table and maps of the status and management of protected area system** in Sudan including: an inventory of all declared and proposed areas (national parks, wildlife reserves and refuges, forest reserves, sanctuaries, hunting preserves and other protected areas). The inventory will identify the institution responsible for the protection

and management of each decreed area, its date of establishment, area, and the protection status of each (i.e., staff in place, management plan published, etc.). In addition to this summary of the current protection and management status of each protected area, an overview of the major threats and challenges facing protected areas in Sudan, and a brief summary of any recognized economic potential of these areas (including productive assets, environmental services, and tourism opportunities) should be provided.

5. An **overview table and maps of the status and management of critical biodiversity and forestry areas outside of protected areas** in Sudan including: an inventory of all declared and proposed areas (e.g., wetlands/freshwater sources, major catchment areas, agriculture ecosystems, etc.). The inventory will identify the institution responsible for the protection and management of each. In addition to this summary of the current protection and management status of each area, an overview of the major threats and challenges facing these areas in Sudan, and a brief summary of any recognized economic potential of such areas (including productive assets, environmental services, and tourism opportunities) should be provided.
6. Descriptions of **plant and animal species that are endangered or threatened** with extinction. Endangered species of particular social, economic or environmental importance should be highlighted and described, as should their habitats. Technical information resources such as the IUCN red list and their websites should be referenced for future Mission access as required. This section should not emphasize species counts, but look at the relation of endangered species and important habitat conservation areas and issues, and evaluate the pressure on those areas, including vulnerability to predicted changes in climate, and current efforts to mitigate pressures, including the participation and compliance with CITES and other international efforts.
7. Recent, current, and potential **primary threats to biodiversity**, whether they are ecological (i.e., climate change, fire, pests, etc.), related to human use (i.e., deforestation, resource extraction, agriculture, contamination, infrastructure development, oil and gas development, etc.), or institutional (i.e., failed policy, lack of enforcement, transparency, or accountability, and mismanagement, etc.) or transboundary issues, as appropriate. Special attention should be given to resource conflict issues, foremost land tenure. These should emerge from a general assessment of national policies and strategies and their effectiveness, issues related to institutional capacity and accountability, trade, private sector growth, participation in regional and international treaties, and the role of civil society.
8. **Conservation efforts, their scope and effectiveness**. This section also should include recent, current and planned activities by donor organizations that support natural resource and environmental conservation, identification of multilateral organizations, NGOs, universities, and other local organizations involved in conservation, and a general description of responsible government agencies. A general assessment of the effectiveness of donor coordination efforts, policies, institutions, capacity, and activities to achieve natural resource and environmental conservation should be included. Priority conservation needs that lack capacity (technical and management), good governance, donor or local support should be highlighted.
9. Analysis of the c**urrent legislation related to the environment and biodiversity, including Sudan's National Development Plan** (or equivalent) This section should include identification of laws related to protection and management of biological resources and endangered species, as well as climate change, renewable energy, and water resource management, and land tenure and property rights issues as well. It should also point out any differences in laws that require further harmonization. This section should also review international treaties signed and ratified, as well as those that Sudan needs to sign in order to conserve and manage its biological resources more efficiently.

10. An overview of the major biodiversity and tropical forest conservation activities of the **commercial private sector** to identify ways to better foster private sector alliances. Of interest are the norms and standards followed by those commercial entities most engaged in management and use of Sudan's tropical forests and tracts in or near protected areas. Consideration of policies promoted by the key relevant governmental ministries should also be included.
11. A brief **analysis of climate change threats and impacts in Sudan**, current and near future. This includes impacts on development and conservation measures (agricultural production, disease prevention, etc.), as well as trends, data gaps and opportunities for carbon market financing mechanisms, and for potential linkages with USAID/Sudan programs and donor collaboration to address climate vulnerability.
12. A brief overview and recommendations for **global health related environmental issues and linkages**, such as population growth, medical waste, malaria prevention and pesticides like DDT, etc. This includes environmental impacts from increased application of pesticides, biofuel production, biosafety or biotechnology (GMOs), invasive species, and use of charcoal cooking stoves, etc.
13. A brief synopsis of the status of oil and gas development in Sudan.

C. Analysis of the extent to which current or proposed USAID actions meet those needs.

1. An assessment of how USAID's program and proposed four-year transition strategy meets the needs for sound natural resource and environmental (especially biodiversity and tropical forestry) conservation, consistent with Mission program goals and objectives. The assessment shall include recommendations on where U.S. comparative advantages and capabilities are likely to have the greatest impact. These issues and recommendations should be prioritized to identify those requiring the most immediate attention.
2. An assessment of how the Government of Sudan and other donor development plans meet the needs for sound natural resource and environmental (especially biodiversity and tropical forestry) conservation, consistent with their goals and objectives, through development objectives other than environment.
3. A brief section examining opportunities for USAID/Sudan to expand interagency, intergovernmental, and international donor collaboration for increased aid effectiveness, especially in the areas of climate change, water resource management, food security, and health.

If any perceived areas of concern related to USAID's program and its contribution or impact arise during this assessment, the Contractor shall provide views and suggestions directly to the Mission Environmental Officer in a separate briefing.

D. Data collection

The Consultant is expected to mainly gather information and documentation within Khartoum-based institutions, and no field visits are expected.

- Meet with USAID/Sudan to get a solid understanding of Mission program goals and objectives under its current Operational Plan; perspectives of this assignment and specific interests for the team, including advice and protocol on approaching USAID partners and host country organizations with respect to this assignment.
- Gather and get acquainted with existing background information on Sudan such as the country's natural resources, geographical, ecological and biological specificities, current

status of environment and biodiversity, institutional organization on entity and state level, key stakeholders and donors in environment and biodiversity, legislation related to the environment and biodiversity, and other relevant information required for the country assessment.

- Interview key stakeholders or managers at selected government entities, donor organizations, NGO's and private sector in Khartoum. The Consultant will develop a list of people to be interviewed for concurrence by the Mission (Program Officer).

E. Illustrative ETOA Report Contents and Outline

The report needs to provide (a) an analysis of the actions necessary in that country to achieve conservation and sustainable management of tropical forests (118) and conserve biological diversity (119); and (b) a sense as to the extent to which current or proposed USAID actions could meet those needs. An illustrative listing of the contents expected in the report includes:

- Introduction, describing the biophysical/human/economic contexts, environmental laws, policy and institutions, overview of environmental programs and initiatives, and the purpose of the present review
- An overview of the state of the natural resources, including forests and terrestrial biodiversity, aquatic ecosystems, and agricultural resources
- An analysis of past and current initiatives in Sudan
- Climate Change Vulnerability and Adaptation
- Opportunities and entry points for USAID/Sudan, including integrated threats analysis, optimal results areas, analysis of legal requirements under the FAA, interventions of other donors, recommendations of environmental experts and recommendations of opportunities and entry points.
- All references used and cited in the report, including Web URLs, people consulted, and their institutional affiliation, endangered and protected species and authors' biographical data. Other references such as the SOW for the analysis, other background or supporting material, including maps and photographs should be included. Copies of key document, maps and images, and copies of photographs obtained during the assessment should also be appended in a CDROM with electronic versions of written materials.

IV. REQUIRED EXPERTISE AND ANTICIPATED LEVEL OF EFFORT

The Consultant should have a combination of complementary technical skills and knowledge in biodiversity, forestry, natural resources management, institutional development, policy, and economics in order to address issues affecting Sudan.
The Consultant is required to have the following qualifications and abilities:

- Senior Level Natural Resources and Environmental Management Specialists with post-graduate qualifications in biology, zoology, forestry or closely related field in natural resource management (including water), land tenure and property rights or natural resource economics. Some knowledge of climate change mitigation and adaptation is desirable.
- Demonstrated experience in Sudan environmental law, the policy and legal frameworks governing environmental management and biodiversity/forestry conservation in Sudan and the analysis of relevant policies.
- Significant experience in integrating health, water, environment, population; and poverty reduction issues is desirable.
- Demonstrated expertise in assessing development programs for impacts on environment and tropical ecosystems.

- Demonstrated expertise in the design and production of environmental impact assessments (EIA).
- Based in Khartoum and able to conduct interviews with government officials, donor representatives and other stakeholders in or nearby Khartoum

V. DELIVERABLES

The main deliverable is an Assessment Report (20 to 40 pages without appendices, plus a 5-page Summary) for USAID/Sudan that examines the environmental threats and opportunities, the biodiversity and the tropical forests conservation and other management related issues and identifies contributions and/or potential contributions to meeting identified conservation needs by the Mission's operational plans. Other deliverables are the following:

- Work plan/schedule within three working days of start date. While most of the work will consist of desk work, a number of government officials, donor representative and other stakeholders may be interviewed. The Consultant will make a list of proposed interviews for concurrence by the Mission within three days.
- Oral debriefing within five working days after completion of the first draft. The Consultant shall meet with the Program Officer and selected staff at USAID/Sudan in Khartoum to provide them with a brief of the report findings. The exit brief shall be accompanied by a short written summary of initial key findings and recommendations.
- Following a two week comment and review period, a revised final report incorporating all comments will be submitted within three weeks of desk work (one hard copy and an electronic copy).

AECOM will support the consultant administratively and will not be engaged in the quality assurance of the report.

VI. TECHNICAL DIRECTION, MANAGEMENT AND COMMUNICATION

The Consultant will report to the USAID/Sudan Program Officer and the TEPS COP. Due to difficulties in travel within the regions of Sudan targeted for this transition strategy, it is envisioned that the Consultant will carry out the assignment from Khartoum mainly as a desk exercise. USAID/Sudan will assist the Consultant in obtaining reference material that is not available in Khartoum.

USAID/Sudan anticipates this ETOA will be completed in approximately 5 weeks (3 weeks of desk work plus 1 week for revisions after a 1-week comments period).

The consultancy will be carried out within the period of approximately May 20, 2018 through June 23, 2018.

WORK PLAN/SCHEDULE

Steps	Dates	Deliverable
1	15 May – 31 May 2018	Desk Work
2	3 June – 7 June 2018	Interviews with government officials, donor representative and other stakeholders (**USAID/Sudan must approve the list of key institutions in the field of Environmental management that will be contacted in Khartoum)
3	14 June 2018	Completion of first draft
4	14 June 2018	*Oral debriefing after completion of the first draft
5	14 June 2018	A short written summary of initial key findings and recommendations submitted at the time of debriefing
6	17 June – 21 June 2018	One week for comment and review period, following debriefing and submitted summary
7	28 June 2018	A revised final report (an electronic copy) incorporating all comments submitted

*The Consultant met with the Program Officer and selected staff at USAID/Sudan in Khartoum to provide them with a brief of the report findings: 14th June 2018

ANNEX 2: REFERENCES

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ANNEX 4: SUMMARY/THE NATIONAL BIODIVERSITY RESOURCE MOBILIZATION PLAN 2015 -2020 FOR SUDAN

Key Sector	Specific practices that drive biodiversity loss	Policies that drive biodiversity loss
Forestry	Deforestation & forest degradation Over consumption and overuse for fuel wood, timber etc Overexploitation for agriculture, Expansion of agricultural schemes at expense of forest, Overgrazing, Wildfires Mismanagement of national parks, and loss of buffer zones around it Lack of integrated management projects	Governances, policies and legislations Underestimation of the role of the forests roles for socio-economic development and environmental protection
Rangelands	Overgrazing is encountered in the vicinity and around areas of permanent water sources.	Land tenure legislation and policies
	Grazing selectivity ,Early grazing before the range vegetation is ready to be subjected to animal utilization	Communal use ,Lack of grazing management systems
	Recent agricultural investment efforts have forced smallholder farmers and agro-pastoralists groups into marginal lands which are mainly used for grazing thus increasing competition with pastoralists lead to over-grazing	agricultural investment lack of land use plan lack of comprehensive investment plan
	Agricultural expansion at expense of rangelands	Agricultural policies ,Agriculture investment Act
	Agricultural practices: weed control in the irrigated schemes and rain fed agricultural where many herbaceous fodder plant species controlled as weeds.	husbandry techniques (Weed control)
	Devastating Popular mining practices	Lack of land use plan and environmental impact assessment studies
	Spreads of treated water of Petroleum explorations and , traditional Mining are highly that contaminated may affect plants and causing death to livestock in some cases	Mining Act ,Weak enforcement of environmental act and Petroleum explorations Act
	Seed collection practices where local people practice range seeds collections from natural rangelands lead to seed loss (mostly collectors harvest the whole plant)	No regulation for range seed collection or production
	Burning of rangelands: practiced by many land users for different Purposes: Farmers burns to protect their crops (burning used as buffer zone), Beekeepers burns for apiary production. Pastoralists: Careless cooking; illegal charcoal production; and Poachers;	Lack of range law
Livestock	Animal movement: Herders simply moved south and as far south as the Northern border of of newly born South Sudan country. This movement brought the danger of exposing the zebu northern cattle types to crossing with the southern Sanja southern types. Desert sheep are also under the threat of crossing with the southern types	Communal use ,Lack of grazing management systems
Coastal zone Fisheries (Red Sea)	Increased marine activities, oily wastes discharged from ships	Weak adoption of National Oil Spill Contingency Plan for Sudan
Agriculture	Modern agriculture; using advanced improved cultivars at expense of	Lack of Land use policy, land tenure

Key Sector	Specific practices that drive biodiversity loss	Policies that drive biodiversity loss
	indigenous ones. Farmers 'practices using outstanding strains of crops this result in the dominance of some genotypes, constructions, constructions mismanagement of natural resources, deforestation, over cultivation of agricultural land.	policy and land fragmentation, No detailed strategic action plan has been developed. Lack of policy & legislation
Wild life and protected areas	Overgrazing, poaching, hunting, mining	

Key drivers of change	Actors and institutions currently responsible for the existing status	New strategies related to the drivers of change	Actors and institutions likely to be responsible for the new strategies
Rangelands			
Loss of range plant genetic resources due to fire, over grazing, weed control, Agricultural expansion at expense of rangelands	Farmers, Beekeepers; Pastoralists; charcoal traders; and Poachers MoLFR, Ministry of Finance and economic planning ((MoFEP), FNC	New strategies is results-based framework strategies that create the necessary conditions at all levels of decision-making, in partnership with main stakeholders, to create an enabling environment that provides incentives for Rangelands sector and actors to join forces in their efforts to conserve genetic resource of range plants, farm animals, and fisheries.	Pastoralists, MoLFR; MoFEP; FNC;ARC; FNC; ITPGRFA;ARC; African Union (thematic program network on rationale use of rangelands and development fodder crop TPN3; NEPAD), gene bank of ARC , GEF, UNEP,FAO IFAD, WB and ;EU,
Loss of Farm animal genetic resource due to Diseases	MoLFR, MoFEP		MoLFR; MoFEP;
Loss of fisheries genetic resources	MoLFR,		
Forests			
Deforestation	MoEPP, MoFEP MoAI, Minerals, Energy, Electricity and Dams, , MoLFR ,Range and pasture, Farmers union, pastoralists union, Local people associations	I-Sudan REDD+ strategy included the main drivers of forestry sector. There is more details on deforestation and forest degradation in relation to the biodiversity and local communities, and focused on the strategic options related to the drivers. 2-Ten years Forestry Sector strategic plan after separation; this strategy focused on the	FNC, Related NGOs (SFS), Ministry of Agriculture and Irrigation (MoAI) and pasture, livestock and local people societies and associations.

Key drivers of change	Actors and institutions currently responsible for the existing status	New strategies related to the drivers of change	Actors and institutions likely to be responsible for the new strategies
		conservation of forestry sector in relation to other sectors related such as range and pasture, conservation of forest genetic resources & conservation.	
Degradation	MoFEP, FNC.		MoEPP, FNC, MoFEP
Endangered trees	FNC, Forestry Research Centre(FRC), MoEPP Faculties of Forestry		FNC, FRC and Academia
Loss of Forest trees genetic resources	FNC, MoEPP, FRC		FNC, FRC and Academia
Agriculture			
Soil degradation	Natural resources, MoAI (Plant protection Department) MoFEP	5 Year National Strategy. National strategy for Desertification. Applied Nap of desertification. National strategy for natural resources. Land use system program. Soil conservation program.	Plant protection Department and ARC
Modern agriculture, Desertification and climate change	MoAI (Desertification Unit), MoEPP, HCENR, MoAI., FNC		MoAI ,Desertification Unit, MoEPP, HCENR, FNC
Diseases & weeds	MoAI (Plant Protection Unit)		MoAI, natural resources department, Plant Protection Unit, ARC, MoAI. and Academia & research centers
Loss of crop genetic resource	MoAI , ARC		
Wild life and protected areas			
Loss of wildlife species genetic resources	Wildlife Research Centre (WRC), wildlife Authority and Ministry of Tourism	Land use policy, no clear and written policy for wildlife, policies that favor rain fed agriculture, mining, and lack of capabilities to enforce the law, lack of awareness and knowledge of wildlife values.	WRC & Wildlife authority

Key drivers of change	Actors and institutions currently responsible for the existing status	New strategies related to the drivers of change	Actors and institutions likely to be responsible for the new strategies
Loss of habitat	Wildlife Authority, FNC		
Hunting & mining	Tourism, Wildlife Authority		
Diseases	WRC		
Marine biodiversity	WCGA	Need new strategy to achieve the goals. reform of Wildlife Act to include marine resources	
Increased marine activities			
Oily wastes discharged			

Strategy/ Years	2015	2016	2017	2018	2019	2020
Mainstreaming	8,025,474	6,136,403	4,942,959.12	5,115,676.1	4,206,315.79	3,702,499.12
Protection	3,120,298.246	3,316,326	3,743,070.2	2,531,754.4	1,947,062.5	1,379,666.66
Restoration	474,035.088	332,280.7	318,771.9	275,000	275,000	275,000
ABS	99,520	200,000	-	-	-	-
Enabling	3,343,105	2,267,772	1,597,544	1,329,211	1,223,439	1,227,895
Total	**15,062,433**	**299,520**	**10,602,345**	**9,251,641**	**7,651,817**	**6,585,061**

Enabling factors	Key Challenges	Key Opportunities
Political will	Firm political commitment to mainstream rangeland biodiversity and ecosystem as high develop priorities	Proposed National Constitution Government should consider efforts to address rangeland biodiversity and ecosystem an integrated element of sustainable development policies (macroeconomic and agricultural policy and climate change). Management and conservation of rangeland biodiversity and ecosystem frameworks need to be integrated into sustainable development planning Establishment of policies to promote biodiversity conservation and sustainable use Policy and strategy analysis: Foster policy and strategy analysis and influencing in order to improve the ecosystem conservation.
Rangelands Legislations	Provision of political endorsement of proposed Rangeland Conservation and	Ratification of Rangeland Conservation and Fodders Resources Development Bill, 2013. Strengthening enforcement capacities of the Government passed a Forest and Renewable Natural

Enabling factors	Key Challenges	Key Opportunities
	Fodders Resources Development Bill Contradictory definitions of "forests and rangelands"	Resources Act in 2002
Good governance	Appropriate range use policies and legislative frameworks Effective institutional support Strong coordination as a result of conflicting and overlapping mandates. Efficient decentralization system that has resulted in usefull communication and coordination between local levels (states) and national level(the Central Administration)	Mainstreaming and adoption of the Pastoral Strategic Action Plan (2014-2020) into economic frameworks and sectoral policies. One of its features is: control degradation of resources, conserve forage plants genetic resources, enhance livelihoods of pastoral and agro-pastoral groups, alleviate poverty at household and community levels and increase their resilience under an environment of climate change. Development of newly Agriculture Sector Investment Plan one of its main Strategic Objectives is Development and protection of natural resources sector to ensure its renewal and sustainability. Empowerment of Pastoralists and traditional farmers so that they can participate and contribute to formulation of appropriate policies and their implementation. Sudan has links with a number of international and regional frameworks that are related to agro biodiversity including conventions, organizations and networks. clarify land tenure and resource rights., Strengthening policy and legislation towards natural resources management and land use system

ANNEX 5: LEGISLATION

Current forest law or equivalent (for example: Act or Code)	F1
Name: **THE FORESTS AND RENEWABLE NATURAL RESOURCES ACT 2002.** (Act No. 11, Gazette No 1690) Date of enactment: December 2002 by: The Ministry of Justice	
Additional information on forest law or equivalent	F1. Inf.
The Act provides the framework for the management and protection of forests and renewable natural resources encompassing pasture and range as well as the framework governing the managerial system of the forestry sector. The Act spelled out the National Forests Corporation's objectives in intensifying afforeststion activities, developing production of different types of gums, NWFPs, encouraging popular participation and presents a good model for sustainable management. The Forests Act 1989 has, since its promulgation, been repeatedly praised as the most important piece of legislation of its kind ever enacted in Sudan. It recognized new types of forest ownership: private, community and institutional forest reserves to be managed by owners, committees and institutions respectively, in addition to the national and regional forest reserves. All these forest reserves would be under the technical supervision of the Forests National Corporation. A recent update for the Forest Law is prepared and submitted to the authorities in 2006 but not yet ratified.	
Relevant document on forest law or equivalent	F1. Doc
Electronic copy is attached. See also FAOLEX: http://faolex.fao.org/faolex/index.htm	

Main elements of the forest law		F. 2
Please indicate – with YES or NO - if the current forest law makes provision to implement the following forest policy elements:		
- Integrated approach to forest management, conservation and development (including sustainability concerns, ecological values and social interests)	YES or NO Yes	F2.1
- Management to entail sustainable multiple forest uses and benefits (including timber, fuel, food and other forest products, as well as biological diversity and resources, protection of ecosystems and watersheds, recreation and tourism, and other environmental services such as carbon sequestration)	Yes	F2.2
- Existence of adequate planning tools (in particular management plans);	Yes	F2.3
- Existence of environmental and social impact assessments/audits (e.g. certification schemes);	Yes	F2.4
- Transparent forest concessions and other contractual arrangements, with provisions for accountability;	Yes	F2.5
- Community-based arrangements, decentralization of responsibilities and devolution of powers to local actors.	Yes	F2.6
Other elements –		F2.7

Other national laws and regulations impacting the forestry sector	F6
- The Interim Constitution 1998 - Environment Protection Act, 2000 - Local Government Act, 2003 - The Public Corporations Act, 2003 - The Wildlife Conservation and National Parks Act 1986 - Water Resources Act, 1995, and Other Water related Legislation - Petroleum and Mining Resource Legislation 1998 - Comprehensive Peace Agreement (CPA) 2005 - The Investment (Encouragement) Act, 1999	

Regulations of the forest law	F3
- Financial & Administrative affairs Regulations- 2007. - Royalties & Fees Regulation - 2006 - Training Regulations – 2007. - Board of Directors Regulation- - Ministerial Resolution No. 268/1991: Obliging the State to combat drought and desertification, to make the Tree National Day, a national occasion, to be celebrated by the 3rd of August of every year, to insert the environmental education in the entire school curriculum, at all the stages, aiming at strengthening the meanings of the environment conservation and maintenance as the concern of all. - Council of Minister Decree No. 40, 1997, approving the economic sector proposals concerning management and division of the forests revenue within the context of the federal system: - Memorandum of Understanding between FNC and States: Between FNC & Ministry of Agriculture, Animal Wealth and Irrigation (Sennar State) regarding Division of Authority and Forestry Revenue of the State: - Ministerial Resolution No. (8)/2001 "the Resolution organizing and controlling dealings in the Genetic Resources of Tree and Shrub species - Ministerial Resolution No 50/2001"Obtaining the approval of the Agricultural Lands Disposition Committee". - Ministerial Resolution No 51/2001 " Banning the approval of agricultural projects in the national forests zones" - Ministerial Resolution No. 52/2001 "Banning of cutting of all trees of Natural Forests & in the Non-attached Areas, Including Trees Around/ or in Houses of Government Utilities or Public Avenues 2001" - Resolutions of the Chairman of the National Salvation Revolution Command Council: Resolution 628 – Attachment of Forests -	
Regulations documentation	F3.Doc
no	

International conventions relevant for forestry signed by the country	F9
- Framework Convention on Climate Change (FCCC) Sudan is a party to the UNFCCC since 1993. - Convention on Biological Diversity (CBD). Sudan signed the CBD in June 1992 and ratified it in October 1995. - United Nations Convention to Combat Desertification (UNCCD), ratified in 1995. - Criteria and Indicators for Sustainable Forest Management, adopted in 2003. - Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Sudan has become a party to CITES on the 24th of Jan. 1983 - Regional Convention for Conservation of the Red Sea and Gulf of Aden. Sudan is a party to the Convention since 1984. - Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Sudan ratified the convention in 2005.	

International conventions – country reports – web links		F9.Doc
Country reports - name	**Date of issue**	**Links**
Sudan country report on Sustainable Development	2002	FOSA
Climate Change Communication Report	2006	http://unfccc.int/resource/docs/nats/sudnc1.pdf http://unfccc.int/resource/docs/natc/sudnc1ann.pdf
Sudan National Action Program on Desertification	2006	http://www.drylands-group.org/Articles/826.html
FOSA Country Report - Sudan		www.fao.org/DOCREP/003/AB574E/AB574E04.htm
Third National Report on the Implementation of The Convention on Biological Diversity	2006	www.cbd.int/doc/world/sd-nr-03-en.doc

The Environment Protection Act (2001)	Section 18 of the Act stipulates certain directives to guide the activities of various concerned authorities. These directives include, inter alia: ▪ Laying down quality control standards for the protection of the environment; ▪ Preservation of air, food, soil, the vegetation cover from pollution and degradation; ▪ Preservation of water sources from pollution; ▪ Preservation of animals and other living beings from extinction induced by illegal hunting or any other threat by human; ▪ Protection of food from contamination or pollution generated by chemicals or any other factor; ▪ Protection of the air space from pollution caused by physical operations or chemical; ▪ Improvement of mining operations in accordance with the best environmental standards, and ▪ Preservation of the antiquities and touristic sites. With respect to the prohibited acts, Section 20 enumerates the following relative violations: a) Polluting water sources, such as rivers, seas, lakes, water courses and other natural and artificial reservoirs; b) Deforestation and illegal removal of the vegetation cover; c) Illegal hunting and endangering the wildlife habitat; and d) Disseminating genetically modified organisms without compliance with the governing regulations.
Sectoral Acts	There are a number of sectoral acts in Sudan dealing with matters related to different biodiversity terrestrial, freshwater and marine components such as: ▪ Wildlife and Protected Area Act (1986). ▪ The Forests and Renewable Natural Resources Act (2002); ▪ The Pesticides Act (1994); ▪ The Freshwater Fisheries Act (1954) ▪ The Water Resources Act (1995); ▪ The Environmental Health Act (1975); ▪ The Petroleum Wealth Act (1998). ▪ The Terrestrial Waters and Continental Shelf Act (1970); ▪ General Regulations and Control of Merchant Shipping Act, (1971); ▪ Red Sea State Environmental Law (2006). ▪ The Sudanese Fishery Ordinances and Regulations. ▪ National Parks, Sanctuaries and Reserves Regulation (1939); ▪ Harbors and Shipping Ordinance (1961).
Conservation of wildlife, fresh water, and marine biodiversity	i. The Convention on the International Trade in Endangered Species of Wild Fauna and Flora; ii. The Ramsar Convention on Wetlands (1971); iii. The African-Eurasian Water Bird Agreement (AEWA) 1999; iv. The Convention on Migratory Species (CMS) 1979; v. The United Nations Convention on the Law of Sea 1982; vi. The Convention on International Marine Organization 1958; and vii. The Regional Convention for The Conservation of the Environment of Red Sea and the Gulf of Aden (PERSGA) 1982.

Biosafety Legislation	In 2010, Sudan has issued a National Biosafety Law, dealing with the application of modern biotechnology, in accordance with the national, regional, and international commitments. This law contributes to ensuring an adequate level of protection in the field of safe transfer, handling, and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking into account risks to human health. The law covers the following: i. Laboratory research and other contained uses of GMOs. ii. Modern biotechnology applications to industry. iii. Modern biotechnology applications to agriculture including trial and field releases. iv. Trade in and transboundary movement of GMOs and their products. v. Food and feed involving GMOs, including relief and aid Materials vi. The specific objectives of the Biosafety Law include the following: vii. Promoting the application of biotechnology as a tool in the sustainable development of the country to benefit the people of the Sudan. viii. Ensuring the judicious and wise use of modern biotechnology in order not to jeopardize the environment and human health. ix. Protecting Sudan's Biological Diversity by preventing genetic contamination. x. Controlling the transboundary movement of the genetically modified organisms (GMOs) and products thereof in accordance with the provisions of the Cartagena Protocol. Last national report on biosafety was the Second Regular National Report on the Implementation of the Cartagena Protocol on Biosafety, which covered the period from 2007-2011.
Land Tenure	Under the Constitution, Sudan's land is classified as public, community, or private. These three types of land tenure affect the responsibilities and obligations of both the state and citizens regarding the conservation and management of natural resources on those lands. Public land includes government forests other than those lawfully held by specific communities and managed as community forests, grazing areas, or shrines. National parks and reserves, water catchment areas, and wildlife sanctuaries are also public lands. All rivers, lakes and other water bodies, the territorial sea, bed, continental shelf, and all intertidal land (between the high and low water marks) is also categorized as public land. According to the Constitution, public land is held by the national or county government, in trust for the people, and administered on their behalf by the National Land Commission. Community land is land registered in the name of group representatives or transferred to a specific community by any process of law, and declared to be community land by an Act of Parliament. Land lawfully held by specific communities as community forests, grazing areas, or shrines, the ancestral lands traditionally occupied by hunter-gatherer communities, and some trust land held by county governments is also classified as community land. Most community conservancies are located on community lands.
The Quarter Century Strategy of Sudan (2003-2027)	• An enhanced role for fisheries in poverty alleviation, food security, human health and environment; • Adopting scientific research and technology advancement as vehicles for increasing productivity efficiency; • Rational utilization, conservation and development of aquatic and fisheries resource through sustainable production management, restocking of depleted fish stocks and pollution control; • Regional and/or international Agreements and initiatives targeting the conservation Sudan ratified the Convention on Biological Diversity (CBD) in 1995, as well as the International Treaty on Plant Genetic Resources for Food and Agriculture in 2002 and Cartagena Protocol on Biosafety in 2005 in the aquatic sector: • Nile Basin Initiative (NBI): The NBI is a nine-nation inter-governmental organization dedicated to equitable and sustainable management and development of the shared water resources of the Nile Basin. Indian Ocean Tuna Commission (IOTC) Sudan has been a member of the IOTC since 1996

Projects implementing participatory approach system

Nabag Forest in South Kordofan State

Nabag Forest in South Kordofan state was one of the reserved forests since 1961, degraded by natural factors and human activities that led to the loss of tree-cover. Raising awareness regarding the importance of the forest and the production of gum encouraged increased willingness of people to participate in the application of agro-forestry system (in their landholdings with expectation of boosting the productivity of agricultural crops and income. The introduction and the implementation of the Rehabilitation Program of the Nabag Forest using public participatory approach included 500 households (about 4000 people) from surrounding communities. This project played an effective role in improving the socio-economic and environmental situation of the target communities and their ecology. Linking of households and communities together, increasing their income and improving the environment canopy by planting more than 5000 feddans of trees and reconstruction of about 1710 feddans of private Acacia senegal (hashab) gardens around the forest.

The socio-economic study of FNC indicated the willingness of most of the people of the area to participate in the Rehabilitation Program of the Nabag Forest. The implemented program which commenced in 2004 was able to involve the local communities, using seeds and seedlings through agroforestry system, with a total rehabilitated area reaching 5900 feddans by 2011. The communities were composed of different age groups ranging between 20 and 50 years old. They were illiterate (26%) or had religious, primary and secondary education base.

Revitalizing the Sudan Gum Arabic Production and Marketing Project

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The Gum Arabic sector in Sudan experienced serious problems that required undertaking immediate corrective measures. The success of the Nabag Forest Rehabilitation Program encouraged decision makers for implementing the "Revitalizing the Sudan Gum Arabic Production and Marketing Project (GAPAs)". The Government of Sudan through FNC formed the GAPAs as a pertinent platform for revitalizing the gum Arabic sector. The project was developed to meet that objective. It was funded by Multi-donor Trust Fund and IFAD, and implemented by FNC. The project covered community activities in different localities of the Blue Nile, Sennar, White Nile, North and South Kordofan states. A package of activities was designed to bring GAPA members and leadership to a level of knowledge and competence which would allow them to undertake fully the long-term responsibility of improving their gum Arabic production and marketing aspects and hence to achieve economic development in the target area. The experience urged for building capacities of target groups, providing them with financial services, water services, transportation, seeds and seedlings for re-farming gum gardens of the households in the target area. The provision of an integrated package of technical work and extension services by the FNC and the project was conducive to enhance the technical and managerial levels of gum Arabic producers and increase their numbers. More than 50% of the households participated in the production processes of gum Arabic boosting their annual incomes.

ANNEX 6: PROTECTED AREAS IN SUDAN

Sudan is characterized by a wide variation in ecosystems and this has been reflected in wildlife, where diversity and diversity of species and animal species .The wild species in the country are distributed according to the type of climate and the environment: Savannah, desert, mountain, wetlands.

Release date	20-December-2014
Contributor	Zeinab Mahde
Geographical coverage	Sudan
Keywords	Biodiversity

Since its inception and in cooperation with the relevant authorities, the Department has sought to establish nature reserves representing all environmental systems in Sudan. The movement of protected areas started in 1935 after the London Conference on the establishment of nature reserves in Africa. There are now 8 federal reserves and 4 reserved areas Birds.

The system of protected areas in Sudan is divided into three types:

- National Protected Areas.
- Reserved areas.
- Bird sanctuary

AL-DANDAR RESERVE

It was declared in 1935 and declared in 1979 as a protected area of 10292 km² located within the three states of Gedaref, Blue Nile, Sennar and on the Sudan border with Ethiopia.

- Ecosystem: Safna
- Plant groups: 58 species of trees and 70 species of weeds and shrubs.
- Animal groups: 27 species of mammals, 150 species of birds, and 32 species of fish in addition to many types of reptiles.
- The most important animals: black, buffalo, deer, dolphins, monkeys, ostriches, various birds, as well as the largest gathering of balsam and the valley's chickens in the world.

THE RADOM RESERVE

It was established in 1983 with an area of 13971 km² located in the state of South Darfur on the borders of Sudan with the Republics of South Sudan and Central Africa.

- Ecosystem: Savannah is rich.
- Plant groups: pigment, mahogany, rock, palm, dom, higlid, seder, drupe, weed and grass.
- Animal groups: deer, milking, dog hearing, baccalaureate, or red back, African elephant that comes from Central Africa.

AL-HASSANIYA MOUNTAINS RESERVE

It was declared in 2003 with an area of 5528 km² located in the state of the River Nile.

- Ecosystem: semi-desert.
- Plant groups: Al-Sammar, Al-Sarh, Al-Markh, Al-Sail, Sidr, Al-Qulad.

- Animal groups: Mei ram, habitual deer, cellular cat, wild bird, rabbits, foxes.

WADI HOR RESERVE

In 2001, an area of 69826 km² was located in the states of North Kordofan, North Darfur and the Northern State. There is no administrative representation of the Protectorate due to the presence of armed conflicts. The reserve is characterized by the existence of archeological sites, caves and drawings.

- Ecosystem: Desert.
- Plant groups: Heglig, Hiraz, Arak, Kalakl, Tarfa, Dom.
- Animal groups: Gazelle, Arabian ostrich, Ostrich.

JABAL AL-DAYER PROTECTED AREA

This area was announced in 2010 covering 333 km² located in the state of North Kordofan.

- Ecosystem: Savannah / Mountain.
- Plant groups: There are 50 species of trees (kena, pigment, sequin, seeder, hoglige, dom, sycamore, thyme, gadim) and 34 species of weeds and shrubs.
- Animal groups: 14 species of mammals such as Nile, Hyena, Abu Rishat, Abu Shouk, Bahshum, and Monkeys; 17 species of birds such as the Valley and 60 species of reptiles.

TAYA-BASANDA RESERVE - TUGBOATS (TRIANGLE RESERVE)

It was declared in 1992 with an area of 567 km² located in the state of Gedaref with the Ethiopian border.

- Ecosystem: Safna.
- Plant groups: Heglig, Talh, Sidr, Tabbadi, Gauguin, Sycamore, Habil, Hashab.
- Animal groups: Deer, wild cats, monkeys, valley chickens, reptiles.

MARINE PROTECTED AREAS

SENNAKNEB RESERVE

It was declared in 1992 with an area of 70 km2 located in the Sudanese territorial waters of the Red Sea State.

- Ecosystem: Marine.
- Plant groups: Different types of algae.
- Animal groups: 124 species of coral reefs and 5 species of sharks, dolphins and whales.

DUGNAB RESERVE

In 2003, it declared an area of 2763 km2 located on the Red Sea coast.

- Ecosystem: Marine.
- Plant Collections: Marine weeds.
- Animal groups: Turtles, fish, seabirds.

RESERVED AREAS

These areas have been declared to protect a specific type of wild species as well as the existing biodiversity.

- Tokar was declared in 1939.
- Sankat announced in 1939.
- Announced 1946.
- Arkuit declared in 1939.

KHARTOUM BIRD SANCTUARY

This sanctuary was declared in 1939 to protect endemic and migratory water birds. Wetland areas: areas that represent wet environments for endemic and migratory birds and a source of water and food for wildlife.

http://sd.chm-cbd.net/biodiversity/wildelife/lhy-lbry-fy-lswdn

ANNEX 7: LIST OF ENDANGERED SPECIES

The following list includes all mammals which occur in Sudan and are rated as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) in the 2004 IUCN Red List of Threatened Animals.

Critically Endangered:

- Addax (*Addax nasomaculatus*).
- African Wild Ass (*Equus africanus*).
- Burton's Gerbil (*Gerbillus burtoni*). (Endemic to Sudan.)
- Four-spotted Gerbil (*Gerbillus quadrimaculatus*). (Endemic to Sudan.)
- Lowe's Gerbil (*Gerbillus lowei*). (Endemic to Sudan.)
- Principal Gerbil (*Gerbillus principulus*). (Endemic to Sudan.)

Endangered:

- Chimpanzee (*Pan troglodytes*).
- Dama Gazelle (*Gazella dama*).
- Giant African Water Shrew (*Potamogale velox*).
- Grevy's Zebra (*Equus grevyi*).
- Nubian Ibex (*Capra nubiana*).
- Slender-horned Gazelle (*Gazella leptoceros*).
- Wild Dog (*Lycaon pictus*).

Vulnerable:

- Barbary Sheep (*Ammotragus lervia*).
- Cheetah (*Acinonyx jubatus*).
- Desert Pipistrelle (Bat) (*Pipistrellus ariel*).
- Dorcas Gazelle (*Gazella dorcas*).
- Dugong (*Dugong dugon*).
- Large-eared Free-tailed Bat (*Otomops martiensseni*).
- Lesser Horseshoe Bat (*Rhinolophus hipposideros*).
- Lion (*Panthera leo*).
- Red-fronted Gazelle (*Gazella rufifrons*).
- Soemmerring's Gazelle (*Gazella soemmerringii*).
- Spotted-necked Otter (*Lutra maculicollis*).
- Tomb Bat Species (*Taphozous hamiltoni*).

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